The
Geographical Journal.

No. 5. MAY, 1903. Vol. XXI.

FURTHER EXPLORATION IN THE CANADIAN ROCKY MOUNTAINS.*

By J. NORMAN COLLIE, F.R.S.

The exploration of the main range of the Canadian Rocky mountains lying between the sources of the Athabasca river and the Kicking Horse pass has been the subject of two papers read by myself before the Royal Geographical Society. In these two papers I attempted to give a description of some of the great snowfields that exist amongst the Rocky mountains, and also as far as possible to make clear the geography of a mountain district up till that time but little known.

Of course, during the short visits that I was able to make, many points of interest could not be answered, for panoramic views obtained from the tops of the snow-peaks were often interfered with, either by other peaks, cloudy weather, or sometimes smoke-haze. It must also be remembered that the country mapped, as the result of these visits, comprises about 3000 square miles; therefore it is not to be wondered at that there were a very considerable number of valleys whose sources were difficult to trace, glaciers and snowfields the direction of whose flow was problematical, and lastly, the altitudes of some of the highest peaks were doubtful. It was to solve many of these uncertainties that last summer I again returned to the Rocky mountains. I wished to discover, (1) what system of valleys lay on the south-west side of the Freshfield range; (2) to traverse the great Lyell snowfield, upon whose ice probably no human foot had yet trod, in order to learn about the complicated series of snow-peaks in that district; (3) to find out how the continental divide ran, and how also the various creeks of the Bush river were connected with the Lyell snowfield; lastly, I had a suspicion

* Read at the Royal Geographical Society, February 23, 1903. Map, p. 588.

that there ought to be an easy pass across the watershed between Mount Forbes and the Freshfield group of mountains. A new pass in this particular spot would be of much interest, for from the knowledge gained in former expeditions there did not seem, except at this spot, to be a possibility of any other undiscovered low pass existing from Fortress Lake pass on the Athabasca to the Kicking Horse pass on the railway line. Moreover, should the pass exist, it would be useful as a means of reaching the headwaters of the south fork of the Bush valley without the terribly hard work of forcing a way from the Columbia river on the west through the dense forests of the Bush valley up to the main range. These forests in 1900 had effectually stopped our expedition to the Columbia group of mountains, and we were forced to return without having reached even the head of the Bush valley. These, therefore, were some of the more important questions that I hoped to be able to answer before I returned to England last autumn.

The members of our party were four—H. E. M. Stutfield, H. Woolley, G. M. Weed (of Boston), and myself. Charles S. Thompson, of Dallas, Texas, one of the most enthusiastic climbers and explorers of these Canadian Rocky mountains, was also to have joined us, but just before starting from Laggan he was unfortunately recalled to Dallas by a telegram informing him that a large portion of the town had been destroyed by fire, including his home; he had therefore perforce to leave the cool breezes and beautiful scenery of the wooded valleys of the Rockies and return to the blazing heat of a Texan summer. In every expedition that I had made before in the Rockies our provisions had been a source of trouble to us; usually at the end of three weeks or so they had begun to give out. This time I was determined that we should not suffer as we had done formerly. I therefore asked our head man, Fred Stephens, who supplied us with horses and food, to start in at least three weeks before us with about 1000 lbs. of necessaries —flour, bacon, condensed milk, etc.—to take them as far as Bear Creek on the Saskatchewan, and there make a "cache." He was then to return with the horses and meet us at Laggan. This would not only enable us to bring in extra food with us, but the trail as far as the Saskatchewan would be cut—no inconsiderable gain, for the Bear Creek "cache" was at least 60 to 70 miles from the railway.

On July 24 we started from Laggan. Besides ourselves there was a Swiss guide, Hans Kaufmann, whom we had engaged from the Canadian Pacific Railway Co., whilst Fred Stephens had brought with him three men, J. Robson to cook, Clarence Murray to help with the horses, and Dave Tewksbury, a mighty axeman from the lumber camps of Wisconsin. Our journey up the Bow valley was without incident, if one excepts the usually harassing time spent in fighting with the mosquitoes and "bull-dogs," which latter this summer were in countless thousands. These "bull-dogs," or rather horseflies, were chiefly a

nuisance to the horses, preventing them from feeding properly, but they did not annoy us much.

It was not till the 28th that we reached the Saskatchewan at Bear Creek mouth. Here, the horses needing a rest, an off day was spent in visiting Mount Murchison, chiefly with the object of seeing again some curious fossil remains that I had discovered in 1898. Finding ourselves, however, on a wrong ridge, we decided instead to climb to the summit of it in order to obtain more knowledge of the group of peaks that constitute Mount Murchison. The ridge seemed endless, but at last, after climbing up some steep snow-slopes and along a narrow arête, we emerged on to the top, which, to our surprise, was the top of Murchison itself.

FRED STEPHENS.

This unexpected result was of considerable value from a topographical point of view, for I was able to see stretched out before me several minor valleys amongst the hills whose existence I was till then quite unaware of. The height of Murchison had been estimated by Dr. Hector to be about 13,500 feet, and he mentions that the Indians said that it was the highest mountain they knew of. Later in another map its height is given as 15,789 feet. A Watkin barometer, kindly lent me by the Geographical Society, made it only 11,100 feet, and as this aneroid agreed during the whole journey with a mercurial barometer I had with me, I take its number as correct.

Geologically, Murchison is most interesting. Not only had I found the curious fossil remains on it in 1898, but it, together with Wilson,

a little further north, constitute the two sides of a gigantic gateway to the hills through which the Saskatchewan turns to the east. The dip of the limestone strata on both these mountains differs in a marked manner from most of the neighbouring peaks, being towards the east. As a result, there are tremendous precipices on the wrong side of the mountain, namely, the western side. In almost every other mountain it is the eastern side that is sheer, with sloping shoulders towards the west and south-west.

Leaving Bear Creek the next day, we made our way up the middle fork of the Saskatchewan along the level bottom of the valley, our goal being the Freshfield group of mountains. On the 31st, in wet weather, we finally camped on the same spot where five years before Baker and I had pitched our tents. This spot was at the head of the "washout" where the glacial waters from the Freshfield snowfields meet those that came down from Forbes. The Rev. J. Outram, who had been mountaineering further north, now joined us, with a Swiss guide, C. Kaufmann, in order to attempt with us the ascent of Forbes and Freshfield. It was not, however, till the 2nd that we were able to get the horses with our camp outfit up to the foot of the Freshfield glacier, and not till the 4th that the weather would allow of the ascent being made. Our party was a big one, but as there were two Swiss guides we were able to split it into two, each party being led by one of the Kaufmanns. Just as with Baker and Sarbach five years previously, we started in the early hours of the morning. The glacier seemed to be exactly the same as we had left it, with the sole exception of a series of huge blocks of rock that had moved slightly down the glacier. Robson accompanied us to the head of the glacier, but it was with some misgiving when we parted company that I saw him start back to the camp alone, for there were so many deep crevasses that still held at their mouths the unmelted snow of the winter, and which were dangerous to any one who might be unaware of the insecure nature of such snow-bridges. However, on our return in the evening, we found that he had returned safely from this his first glacier expedition. Following the same route as Sarbach had taken Baker and myself, we rapidly climbed upwards, and I was naturally anxious that the day should remain fine, for once at the top of Freshfield, I should be able to see that part of the country which lay beyond on the western side, and which on my map was blank; also the complicated geography of the south branch of the Bush valley would be capable of being followed for the first time, and lastly, the question whether a low pass existed between the Lyell and Freshfield systems of ice-fields could be answered. Long before we arrived on the final arête of Freshfield this last question was settled, and it was with much satisfaction, as we mounted higher and higher, that I could follow how the valley that lay on the south side of Forbes took a bend to the south-west, joining a similar depression running north-east from the southern

fork of the Bush valley. The pass therefore existed, as I had always hoped it would, ever since when in 1897 I had penetrated into this lonely mountain land with Baker and Sarbach.

Towards the top of the mountain several difficult faces of rock and thin rocky edges had to be surmounted, but H. Kaufmann, who was leading, never seemed to be in any way anxious about our final success; ultimately we reached the summit, 10,900 feet, which consisted of snow, and was like most of the summits we ascended, heavily corniced with snow. The weather was perfect, and at our feet lay the unknown country, every valley plain; glaciers and streams sparkled in the sunshine, and, as I had more or less imagined from glimpses through the murky

BUSH PASS AND FRESHFIELD GROUP.

atmosphere of the Bush valley in 1900, directly to the west was the glacier which fed the south fork of the Bush river. To the north were all our old friends of 1898—Columbia, and Athabasca peak, Alberta, with the Twins straight in front, appearing to be part of it, the Dome, Lyell, Saskatchewan, and many more; to the west the Bush peak and the far-off Selkirk range beyond the Columbia river. Nearer to us on the south lay Pilkington, Walker, and Mummery. There is a great pleasure in standing on a high mountain in a country but imperfectly known, so many uncertainties vanish in a moment, often with the remark, "I thought so," whilst masses of new possibilities and further queries take their place. One of these queries which could not be answered was the height of a splendid pyramid of snow gleaming far away in the Selkirks. This peak we had seen day after day in 1900 from the Bush valley; now from a still greater distance it seemed even greater in

height, but what that may be must still remain unanswered. On the next day we returned to the "washout," near where the streams from Forbes and Freshfield meet.

In order to get our camp moved up to the foot of Forbes, it was necessary to cut a trail through the woods, and whilst this was being done we spent a delightful summer's day climbing on to the alp that lies on the east and north-east of Forbes. This alp is the largest that I know of south of Wilcox pass. In the early summer it must be carpeted with flowers, and even in August there were many still left in bloom, whilst the remains of numberless others could still be seen. This spot also seemed to be a favourite haunt of the mountain goat, for on emerging from the woods below on to the almost flat upper pasturage, large numbers of goats could be seen grazing in small groups, and over fifty head were counted. Soon, however, having caught sight of us, they moved off towards the precipitous faces of the hills that overlook the Saskatchewan on the east. That this country is much frequented by goat was again noticed just below Glacier lake, where, a log-jam having occurred across the river, forming a natural bridge, a large and newly worn goat-track was found leading down to this bridge on both sides of the river. Even in Dr. Hector's time (1858) this spot seems to have been a favourite crossing-place, for he mentions that, "while halting here a big-horn sheep came down the mountain almost close to us, but, seeing us first, made off without our getting a shot. Nimrod," an Indian hunter who accompanied him, "says this is the only place where these are to be seen so far in the mountains. A little way further through the woods brought us to a large lake, which occupied the full width of the valley." He then goes on to relate how his Indian ponies behaved in exactly the same manner as ours had often done; to again quote, "As we were chopping our way along, the same horse that played that frolic once before again plunged into the water and swam off into the lake. We had to leave him alone, lest our endeavours to get hold of him should only start him for the other shore of the lake, which was a mile wide."

To return, however, to the alp. Weed and I, after climbing to the upper and north side of the alp, ascended a small peak, from which there was a splendid view in every direction except to the north. The pass leading over to the Bush valley, which I have named the Bush pass, was plainly visible, and I was in hopes that it might prove feasible for horses; I visited it a few days later. A somewhat short but steep snow-slope on the eastern side proved that pack-horses could probably not be taken across.

It was not till the 8th that we moved our camp up the valley, camping in a small clear space that had been denuded of trees many years ago by a huge avalanche that had fallen from the south side of the valley, and, after crossing the stream, had swept away the forest

for perhaps 100 yards up the opposite face. From this camp, on the 9th, we started with blankets and food for a bivouac as high up Forbes as possible. Ultimately we camped directly under the peak, just at the limit of the tree-line, but not more than 1400 feet above our camp down below. During the night, although at the camp below the temperature was below freezing-point, yet amidst the great fir trees on the mountain-side where we bivouacked the air was quite warm. This may perhaps be due to the dense forest being much heated during the day-time by the sun, then, owing to the tendency of hot air to rise, a slow but continuous current of air filtered up the mountain-side amidst the trees, so keeping us warm nearly the whole night. Early next morning, almost in

MORAINE LAKE, DESOLATION VALLEY.

the dark, we started for the ascent of Forbes. The day was perfect; only a faint but cold breeze blew. Soon we got to the small glacier under the peak; then, keeping to our left, struck the southern ridge. Here some difficult rock-climbing was met with, but C. Kaufmann led us rapidly upwards towards the snow-covered shoulder. Above the shoulder was perhaps the most difficult part of the climb, for there the arête became excessively steep, and in more places than one the rock was very insecure, being torn and shattered by the frost, making great care necessary. This part surmounted, a snow climb led us to the summit, 12,000 feet, which, like the summit of Freshfield, consisted of a huge snow-cornice.

At the suggestion of C. Kaufmann, who had seen the north-west

face of Forbes about ten days before, we did not return by the same route, but descended the snow-covered north-western side. Here we fortunately found the snow frozen hard, for the face was much too steep to walk down. For over 1500 feet Kaufmann had to cut every step; but at last we reached a small col, which was the connecting link between the massif of Forbes and the mountains on the west. Rapidly we glissaded from this col to the glacier below; then, skirting underneath the great southern precipices of Forbes, we came to the foot of the southern ridge, up which we had climbed in the morning, and just as the sun was setting we got back to our bivouac, too late, however, to think of returning to the camp below that night. But we had enough food to last us; so, lighting a fire, we talked over the climb, and then slept comfortably for the second time under the pine trees in the open air.

Next day, in company with Weed and Rev. J. Outram, I went up the valley to the Bush pass. To take horses there would mean an immense amount of cutting for the first few miles; after that, however, the valley opens up. But, as I have already said, even were horses brought as far as the foot of the pass, it is very doubtful whether they could be got up the steep snow-slopes which have to be surmounted before the summit is reached. On the west side there seems to be no difficulty and no snow, the valley stretching in a south-westerly direction till it joins the south branch of the Bush valley, which runs at right angles.

On the summit of the pass all the rocks are heavily glaciated, and at one time a huge glacier must have poured over it, whether in a northerly or southerly direction it is impossible to say. The height by the aneroid barometer was 7600 feet. We then returned to our camp, where we found that Fred Stephens, as we had not returned the night before, had become very anxious, and had ideas about organizing a search-party.

The ascent of Forbes was of much value to me, for whilst in the Bush valley I had never been able to see what lay between Forbes and the Bush peak; of course, from Forbes that part of the country lay at my feet, also the whole of the great Lyell snowfield, also how the west branch of the north fork of the Saskatchewan bent round up to the Columbia ice-field and to Mount Bryce—all this I could see. But we were all disappointed in the height of the mountain. Although a few days previously I had, by means of a base-line, a Steward's surveying telemeter, and a clinometer, made it to be about 12,250 feet (the mean of two observations), yet we hoped that it would prove to be considerably higher. By the aneroid, however, it was only 12,000 feet. It is true that the only times that I had seen Forbes from any high altitude and entirely free from clouds were from Freshfield with Baker in 1897, and from Athabasca peak with Woolley in 1898, but in the latter case the smoke haze almost obliterated it, making it loom out in a mysterious

and exaggerated way. Owing to the same cause we had also rather overestimated the heights of Columbia and Alberta. Whilst we were on the summit of Forbes, the only peaks that seemed higher were those to the north round the Columbia ice-field. Lyell was lower, and of course all the peaks to the south.

After our return from the Bush pass, on August 12 the Rev. J. Outram left us, in order to return to the west branch of the north fork of the Saskatchewan. We took our camp down the valley, and, turning southwards towards the Howse pass, camped underneath the Howse peak, which we climbed on the 14th. This peak, by aneroid barometer, is apparently about the same height as Freshfield, being 10,800 feet, and

MOUNTS BIDDLE AND HUNGABEE.

is a remarkable instance of a peak that has an easy side towards the west, while its eastern face is formed of a series of impossible precipices facing Bear creek and the Waterfowl lakes. From the Howse peak a good view of the Freshfield group was obtained, and I have named a fine peak on the eastern side of the Freshfield snowfield after Sir Martin Conway. Leaving the Howse peak behind, we next made our way towards the Lyell ice-field. Camping near the foot of Glacier lake, it was our intention to cut a trail up the side of the lake, but this was frustrated by our finding the woods on the northern side of the lake on fire. Fires in the dense pine woods of the Canadian Rockies are excessively dangerous to be near, and had it not been for a considerable stretch of hillside between us and the fire that had been cleared by avalanches, it would have been most foolish to go anywhere within miles of these burning woods

A gale may suddenly spring up, and before one has time to escape through the dense forest to safety, one's camp, one's horses, and one's self may all be involved in a common ruin. That a fire should have swept through this particular piece of country is very much to be regretted, for it will be at least a century before the ravages can be repaired, and, in the mean time for many years to come, the scenery of one of the most beautiful lakes in the Rocky mountains has been sadly marred. There it lies with one shore blackened and shorn of its beautiful primeval forest; whilst the charred trunks of the great pines and the poor stunted undergrowth will remain for years to come as a mute protest against the carelessness of those who do not see that their camp fires are properly extinguished.

As it was out of the question to attempt to cut a trail along the side of the lake, our only alternative lay in sailing up on a raft. For a whole day Fred and Dave toiled with the axes, and we could hear the ceaseless chopping down to the water's edge. Then the weather turned wet, and the fire up the valley was nearly extinguished. Fishing in the deep pools of the river that runs out of Glacier lake was indulged in, and with a piece of twine 6 feet long, a pole of the same length, and a hook baited with some bacon fat, I caught a bull trout about 5 lbs. in weight.

On the 19th the weather cleared. With much luggage we embarked on the raft, and slowly made our way along the shore to the upper end of the lake, where we camped, our horses in the mean time being left near the old camp, on some good feeding-ground up the mountain-side.

From this spot we started for the Lyell ice-field, bivouacking at the foot of the glacier. The next day saw us start for the upper snows. We kept to the east of the Lyell glacier, and followed very possibly the direction taken by Dr. Hector in 1858, when he climbed Mount Sullivan. To climb straight up the Lyell glacier on to the icefield above would be both foolish and dangerous, for the ice from above descends in a huge cascade from the higher levels over a wall of rock, and in most places would be quite impossible to climb up from below. By ascending a lateral valley to the right this was avoided, and we ultimately reached the great plateau of snow which is one of the sources of the Saskatchewan.

Before this, however, we scrambled to the summit of a rock peak that overlooks a valley running due east towards Mount Wilson. This valley is full of small lakes, and at its head is Mount Lyell. Once on the great snowfield, we slowly trudged onwards. This day was warm enough to melt the upper crust of the snow, making progress rather tedious, and the summit of Lyell that we had thought of climbing became covered with cloud whilst we were still over a mile away. The question whether we should climb in mist to the summit of the mountain, or instead strike across to a small eminence near the centre

of the glacier, was soon settled—I am afraid, much to Hans Kaufmann's disgust. All he could say was, "Not climb Lyell! You will regret it very much." I think that Woolley, too, who ought to have known better, heartily agreed with Hans, thinking that we were far too lazy a party to go out with, when serious mountaineering was the object. Be that as it may, personally, I was glad that the plans were changed, for, once on our small peak in the centre of the snowfield, I could see the Bush peak well, and the valleys round it; also other peaks to the north of the Bush peak, on the western side of which we had been in 1900. Moreover, I could follow how the ridge, of which Lyell is a part, bent away to the north-west and the Thompson pass. We descended by a shorter but more precipitous way, and on one steep glissade of about 300 to 400 feet, in attempting to save my pipe, which I had knocked out of my mouth with my ice-axe, I lost my balance and completed the last half of the descent in all sorts of positions, sometimes head first, and sometimes rolling over and over. Fortunately there were neither rocks nor crevasses, and the snow was soft, so no damage was done; and, what was also fortunate, nobody on the glacier below was quick enough to photograph me during my ignominious descent. Later, we got back to our bivouac, and, in order to avoid the very bad trail on the left bank of the stream, we crossed the snout of the glacier, investigating on the way a deep canyon through which the glacier stream flowed. Towards evening we were back once more in our tents at the head of Glacier lake.

On the next day, August 22, we broke up the camp, and, starting early on our raft, sailed gallantly before a westerly breeze, and, under the care of Dave, to the foot of the lake, where our horses were. That evening saw us again at Bear creek.

If time had permitted, we should have liked to visit our old haunts on Wilcox pass, where we were in 1898; but it was impossible, so we turned our faces once more to civilization, returning by the same route by which we had come. On the 24th we climbed an easy peak (Mount Noyes, 10,000 feet), which lies to the east and a little further up the valley than the Waterfowl lakes. From the summit an uninterrupted view of the country lying between Bear creek and the Sifleur river was obtained, and a portion of the country lying behind and to the east of Murchison I saw for the first time.

From this summit it was most evident how isolated Murchison was, and its series of rugged peaks stood up magnificently against the white clouds. Almost due north, and to the right of the most easterly point of Murchison, could be seen the highest of the peaks in the group lying between the Cataract river and the Saskatchewan. This peak overlooks the historic Kootenay plain. I have named it "Cline" peak.

It is curious how this small level plain, hidden away amongst the hills—the Kootenay plain—is now hardly, if ever, visited by man.

Perhaps once a year a few Indians come there for the hunting. Over half a century ago, however, it was very different; for on this Kootenay plain hundreds of the Kootenay Indians from the west of the Rocky mountains, after crossing the Howse pass, held their annual fair at this place with the fur-traders and the Indians from the eastern slopes of the Rocky mountains. This meeting had, even in Hector's days, been long discontinued, and he tells how Nimrod pointed out a large tributary of the Saskatchewan coming from the north-west, called the Waputeehk, or White Goat river (the Cataract river of Coleman), up which lay a trail to Jasper House on the Athabasca. To quote Hector's journal again: "Through this valley Nimrod said a trail runs to Jasper House, known as 'Old Cline's trail.' Cline was a trader that every summer travelled through the mountains from Jasper House to the Kootenay plain." This is now ancient history; not only have the Indians and the fur-hunters almost entirely deserted these upper waters of the Saskatchewan, but most of the game has gone too. Although Hector came across droves of sheep and rams on one occasion whilst sitting on the mountain-side just above the Kootenay plain, he says, "A flock of at least a hundred rams rushed close past me, so close, indeed, that I hit them with stones," yet even in these days the game had become scarcer than in former years. He also found traces of buffalo as well, but the Indians told him that, eleven years previously, "there were great fires all through the mountains and in the woods along their eastern base; after that a disease broke out among all the animals. Before that time (somewhere about 1847–1848) there was abundance of game in all parts of the country; but since then there has been a great scarcity of animals, and only the best hunters can make sure of killing." Probably nowadays the scarcity is partly due to the wholesale slaughter indulged in by the Indians, and there is no doubt but that some measures should be taken to stop it.

After the ascent of Noyes we returned to Laggan and civilization, but, having a few days at our disposal, we took our whole camp up to Moraine lake and Desolation valley, a spot that can be visited in one day from the chalet at Lake Louise. Our object was purely mountaineering; two fine peaks, Deltaform and Hungabee, being accessible from the head of Desolation valley. Owing to unsettled weather, we did not try to ascend either, but, instead, climbed a most interesting rock peak, Neptuak (10,500 feet), by the ridge that leads from a snow col between Desolation and Prospector's valley. On the moraine of the glacier in Desolation valley some most curious and apparently fossil remains were found in the Cambrian quartzites.

On September 5 we returned to Banff, our expedition ended. Our trip had been most successful; almost uninterrupted fine weather had lasted during the whole time; we had always been able to go where we wanted, owing to there being no trouble with either the commissariat

or the trails. A great number of questions relating to the peaks, passes, and glaciers had been satisfactorily solved. The chief points being: (1) The heights of Forbes, Murchison, Freshfield, and Howse had been barometrically determined; (2) the discovery of a pass across the range between the Lyell and Freshfield groups of glaciers; (3) the exploration of the Lyell glaciers and how the watershed ran from the Freshfield group to the Columbia group; (4) a much more detailed topographical knowledge of various outlying portions of the mountains; for instance, the portion south of the Freshfield group, that east of the Murchison group, also that north-east of the Wilson group.

If time permitted, I should like to have said something about the

FOSSIL REMAINS IN CAMBRIAN QUARTZITE, FROM DESOLATION VALLEY.

individual members of the expedition, how Hans was always in the best of tempers and a first-class guide, willing to do all things from hard work on the mountain side to transporting gigantic logs for the camp-fire or mending boots; how Dave told us most wonderful stories about the lumber camps, and how single logs could be used for the purposes of navigation instead of an ordinary boat; how Clarence spent many weary hours searching for the wary Indian "cayeuses" in the thick woods when they were determined not to be found; how Robson, who had been through the Boer war with Strathcona's Horse, had great things to tell of the prowess of General Buller, and the ignorance of those who knew not the peculiarities of horses and the various methods of "getting along" in the open veldt; and lastly, of the genial Fred,

to whom we largely owe the success of the expedition, always willing to do two men's work, always cheerful, and as good a hunter, trapper, and organizer of an expedition as one could ever wish to meet. It was worth travelling to the Rockies only to spend a fleeting month or six weeks in his company. May he continue to prosper, and may it not be long before we meet again.

Note on Rock Specimens from the Canadian Rocky Mountains, by Prof. T. G. Bonney, D.Sc., F.R.S.

Mount Freshfield.—The specimen from near the summit is a limestone. A pebble from the glacier with a speck, possibly sodalite, appears to be a crushed and decomposed diabase.

Bush Pass.—Two specimens, both calcareous, but one is perhaps from a superficial deposit.

Mount Forbes.—The specimens from near the summit are limestones.

Mount Murchison.—Pisolitic limestone, with small fragments of organisms.

Howes Peak.—Also a limestone with smaller fragments of organisms.

Mount Noyes.—A dark limestone containing a silicified coral, like a Lithostrotion; another specimen is also a limestone containing two or three very imperfect trilobites.

Neptuak.—The specimens are limestones. A blackish one on analysis showed traces of petroleum hydrocarbons, and after treatment with hydrochloric acid, left a deposit of amorphous carbon.

Desolation Valley.—These specimens are remarkable. One is a limestone breccia, slightly dolomitic like some of the others, the matrix being iron-stained; five are specimens of a white quartzite, two with worm-tubes running more or less horizontally, resembling those called Planolites; on three can be found an occasional worm-tube, one or two bilobed markings of an ovoid shape, and some which are parallel, elongated, and slightly triangular in form, probably the tracks of a crustacean. Another piece of quartzite of a greenish-grey colour shows on its surface the first and third of these markings. But the most curious specimen is a slab about 11 × 5 inches and $1\frac{1}{2}$ inch thick (with a smaller fragment). It is a darkish, slightly ferruginous quartzite, which on one side passes quickly into a hard greenish argillite, and on the other rises into a number of mounds about an inch in diameter and rather less in height, having usually a slight indentation on the summit. They consist of quartzite continuous with that of the slab below, and an argillite like that on the opposite side apparently clings to their bases as if they rose through it. Some worm-burrows seem to pass along this, and once at least over one of them. The quartzite is found under the microscope to be composed of quartz grains in a felspathic matrix, the latter being now replaced by a minute somewhat micaceous secondary product. The mounds and tubes are mostly covered with a filmy ferruginous glaze. At first sight the mounds remind me of concretions in the magnesian limestone of Durham, but the microscope reveals nothing in favour of this idea, and shows the material to be continuous with the quartzite of the slab. The mounds then most probably are on the lower side of the slab, and casts of pits formed in the mud, very likely by worms retreating into it. Worm-burrows and the like are not very trustworthy evidence for the date of a rock, but I should think these specimens indicate some part of the

Cambrian system. Several of the limestones have a general resemblance to those brought by Mr. Whymper from the districts on either side of the Canada-Pacific Railway.

Before the reading of the paper, the PRESIDENT said: It is scarcely necessary for me to introduce Prof. Norman Collie to you, because he is an old friend, and we have already, within the last three or four years, listened to two very interesting papers from him. I think we may feel sure the paper he is about to read this evening will be equally interesting.

After the reading of the paper, the following discussion took place:—

Mr. STUTFIELD: You have heard from Dr. Collie an account of our expedition, and you have seen on the screen the map of the scene of our travels through the Rockies. Some of you may not know that the greater part of the country covered by that map was a blank five years ago, when Dr. Collie and Mr. Baker started. A large part of it was a complete blank, for the great Columbian icefield and the lofty peaks surrounding it were only discovered in our expedition in 1898. I think you will therefore agree with me that Dr. Collie has made a considerable addition to our stock of knowledge of this little-known part of the Canadian Rockies. I say little-known, because the thing that struck me most out there was the ignorance that prevailed concerning the mountains. I was trying to get some information for our trip in 1900, but the information I obtained amounted to absolutely nothing. I think even if you look on the best and most up-to-date maps that you can find anywhere nowadays of this part of the country, you will find the details extremely meagre, and such details as there are are very largely wrong. I was in the Society's rooms the other day, and, looking at one map, I saw Mount Hooker marked as 15,700 feet (?); I turned to another, and there I saw our friend Mount Murchison marked as 15,781 feet. However, with regard to these heights Dr. Collie has pointed out that we also made mistakes, and I am afraid it was owing to my mistake in 1898, owing to the smoke haze, we over-estimated the height of some of the mountains; but I think if we over-estimated them then, Dr. Collie has under-estimated them now. I know this much, that the weather was exceptionally fine during our trip, and the barometer exceptionally high, but I cannot help thinking that the differences of reading appear too great. The difference in one instance between the reading of 1897 and that of last summer amounted to about 900 feet, and that seems to give a very considerable margin for error. In the mountains the atmospheric conditions vary very much. Perhaps I shall be on surer ground if I say a word about the Rockies from the point of view of an Alpine climber. This year we were exceptionally fortunate in the weather, and having climbed several heights we were able to see the mountains to the best advantage, and to form a pretty fair estimate of what they were like. I think it may be said at once that, though they are very fine, they are not equal to the finest mountains in the Alps, that is to say, there is nothing in the Rockies quite so stately as the Matterhorn or the Italian side of Mont Blanc: and also, from what Mr. Ruskin would call the greased-pole point of view, they do not afford such fine climbing. Our climb on Mount Forbes was distinctly very difficult and also a sensational one; it would be so considered, I think, in the Alps. But for the majority of mountains they are not equal to the Alps in that respect, but in other respects the Rockies are superior. Those vast primeval forests with their wonderful undergrowth, with the magnificent trees and the tangled ruins of trunks, are things which you cannot find in Europe. The scenery of the Rocky mountains is exceedingly beautiful, and I cannot help thinking that future generations will be grateful to Dr. Collie, who has explored that great mountain system where

three immense rivers take their rise, the Columbia, the Athabasca, and the Saskatchewan.

Prof. BONNEY: I am sure we shall all feel grateful to Dr. Collie for having introduced us to a strangely beautiful country which seems to me to combine the scenery of the western Oberland, but with much finer glaciers, with the pines of the Dolomites. Surveying work such as he has been doing has a peculiar value. My own experience nearly forty years ago, in parts of the Alps which were then imperfectly mapped, has taught me the value of panoramic views. It is surprising how much information you can then bind together, and how many illusions are dissipated. However, I will not detain you with speaking upon those matters, but just say a word or two about the specimens he has brought back. It so happens that I have seen, though I have never been in the country, a good deal of the rocks from the mountains on both sides, and especially the north side, of the Canadian Pacific Railway. There is a very great similarity about most of them. They are limestone, and are curiously destitute of fossils. Mr. Whymper found one place only which yielded many fossils, chiefly trilobites, which were described in the *Geological Magazine* by Dr. Henry Woodward. Dr. Collie has brought back but very few fossils indeed from the north side of the Canadian Pacific; in fact, I might say that two or three from the neighbourhood of Mount Noyes are all, and those, though imperfectly preserved, are not improbably of a Lower Carboniferous age. But those from Desolation valley, on the south side, are remarkable and very difficult in some cases to determine. There are a number of worm burrows which agree with those which geologists call *planolites*, and perhaps it is safer to say they are worm burrows and nothing else. Besides that, there are some curious marks which I think most probably are the tracks of some large crustacean; and there are also some mounds like half-apricots which are dignified sometimes with the name of *bilobités*, which leaves you about as forward as you were before it was mentioned. Most likely they are tracks of some lowly organized creatures. And, lastly, there are those extraordinary hemispherical mounds. Among them are a number of worm-tracks. The mounds are formed of the very hard sandstone which is called quartzite. So far as I can make out, they are casts of pits made in a sort of clay. I think it probable they are made either by worms or by some other organisms, for I recollect to have seen pits something like them on the seashore. They are certainly the strangest things I have ever seen. I took a specimen to the British Museum, and found they had nothing of the kind in the collection there.

The PRESIDENT: We have to welcome a distinguished member of the Geological Survey of Canada, Mr. Ami, who, I believe, came to this country purposely to receive a medal from the Geological Society in recognition of his geological work. I hope Mr. Ami will address the meeting.

Mr. AMI: I must say I did not expect to be called upon to say anything here to-night, but it would be very ungracious on my part if I did not express my gratitude and thanks for the privilege and pleasure I have had in listening to the admirable lecture given by Dr. Collie, and also for the pleasure of again viewing those magnificent mountains in which I spent a summer south of the area described by Dr. Collie. These mountains, as you are aware, are called "Rocky." They are rocky from the base to the summit. They are to the east of the great Selkirk chain, which, if possible, surpasses them. There is here certainly very fine scenery; not only in the trees and forests are there great sources of wealth, but there are also many minerals. Before concluding I must say it has been a great pleasure to me to see those specimens brought back by Dr. Collie. I have over a thousand specimens from the regions of the Rocky mountains, which I myself

collected on Mount Stephen. I brought back probably 1500 specimens. The late Dr. George Dawson also brought back an interesting series of fossils, of which we hope a monograph will soon be presented to the world.

Colonel CHURCH: I have been listening to the very interesting lecture of Dr. Collie from perhaps a different standpoint from what has been expressed by the previous speakers, and that is its enormous value to the development of perhaps the most important colony of Great Britain. Whenever we have a lecture which is of practical importance showing the value of our geographical efforts to the world, we should call attention to it especially. If we look at the Dominion of Canada, we find that its communication with the Atlantic ocean is very difficult for at least four or five months of the year through the Gulf of Lawrence, owing to the ice and the fogs which make navigation extremely difficult. On the west side, we have a rocky mountain range, east of which is perhaps the finest wheat-field in the world. If that wheat-region had easy access to the Pacific ocean, it might almost supply the Orient with its bread stuffs, but unfortunately there comes this great mountain barrier which is the prolongation of the South American Andean system. It breaks down here [indicating on map] and then gradually rises up to Mexico about 7500 feet. (I am stating these figures from memory, so I hope you will excuse me if I make a mistake.) Again it slopes down in northern Mexico, and, entering the United States, we find the southern Pacific crossing the continent at an elevation of 5000 feet. Then we move north, and gradually the mountains rise again until the Union Pacific Railway crosses them at about 7000 feet elevation, and once more decreasing in altitude towards the boundary-line between Canada and the United States, the Northern Pacific Railway and the Great Northern cross them at about 5200 feet elevation. Then up go the mountains once more, barring the development of Canada from the Pacific ocean where the crossing of the Canadian Pacific is, I believe, at an elevation of about 5300 feet above sea-level. Now, the district explored by Dr. Collie is one of the first importance. I did not catch from him the elevation of the Bush River pass.

Dr. COLLIE: 7000 feet.

Colonel CHURCH: You see, therefore, that from the point where the Canadian Pacific crosses the mountains they rise rapidly, and when we go still further north, we reach a great depression in the Rocky mountain chain. The Peace river cuts through it, and the pass is about 2000 feet elevation, while just a little to the south is Pine River pass, 2600 feet elevation. Again the mountains commence to rise, so that it may be said that between the Kicking Horse pass and the Yellow Head pass, Canada has very little hope of reaching the Pacific ocean by any route useful for commercial purposes. So that Dr. Collie has presented to us to-night, as well as to the Dominion of Canada and the British Empire, most valuable information, of which I wish I could speak in terms that would make it appreciated in a geographical sense, in order that all might understand that the geography we learn here has its extremely useful side, worth a great deal more perhaps than England understands. If it understood it better, it would give us a geographical building adequate to our requirements. However, I want to say that through this Peace River pass we come to two lakes which lay practically upon the summit of the Rocky Mountain range, and then reach the Skeena river, by which we arrive at the finest port of the Pacific coast of the Dominion—Port Simpson. Here there are immense coalfields. I am only stating these facts to show what wealth there is in this country called Canada, which for so many years was called "our lady of the snows," which, by-the-by, is nothing but a derivation from the name of an old Spanish monastery. The wheat belt of Canada starts from here, runs to the southern end of James bay, thence north-west to Great

Slave lake, and then towards the Rockies; but west of Lake Winnipeg we have about 400,000 square miles of as fine wheat lands as there are in the world, which give just twice the crop per acre of the lands of the United States, and when I tell you the wheat crop of the United States is raised on 100,000 square miles of land, and here there are 400,000 square miles, you may well understand that Great Britain ought to get her bread stuffs from her own territory if she be a wise nation. I have tried to give you a little idea of the practical value of this splendid paper to which we have been listening, and thank you very much for your kind attention.

The PRESIDENT: We have listened to a most interesting paper, and also to a very valuable discussion. I think we must all feel admiration for the perseverance and ability with which Prof. Norman Collie has, during four successive expeditions, first explored this very difficult mountain region from a geographical point of view, and then has filled up all the topographical details by ascending lofty and difficult mountain peaks, by traversing very dangerous icefields, and by discovering at least one important pass. You will, I feel sure, pass the vote of thanks which I now propose to Prof. Norman Collie, by acclamation.

THE BRAZEAU ICE-FIELD.

By Prof. A. P. COLEMAN, Ph.D., Toronto University.

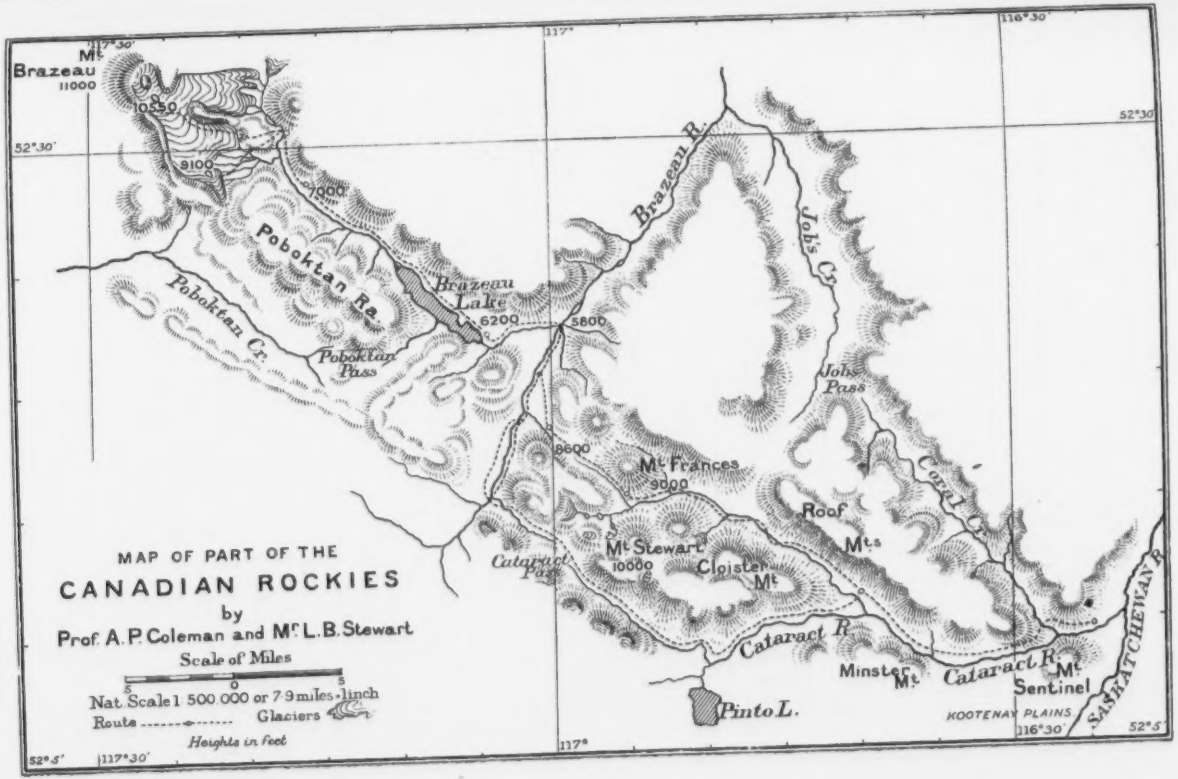
DURING the month of August last summer, a brief trip was made to some hitherto unvisited valleys to the north-east of the region mapped by Wilcox* and Collie† in the Rocky Mountains, and about 50 miles of new trail were explored and mapped. The party consisted of Mr. L. Q. Coleman, his wife, Mr. Proctor Burwash, and myself, with four riding-ponies and as many for packing. As on former journeys, we travelled without guides or professional packers. Since my last journey in 1893 all the expeditions which have gone into the Canadian Rockies have made Laggan their starting-point, but we followed our former route, starting from Morley just east of the mountains, and making use of the trail made by the Mountain Stonies in their northern hunting trips. The route is longer, but the trail has certain advantages, since it is well beaten, has a drier climate than trails nearer the watershed, and presents a greater variety of scenery, including bits of prairie and foot-hills, park-like valleys near the "gaps" in the mountains, and a gradually increasing boldness of the mountain forms as one approaches the heart of the great range.

In the nine years since we had used the trail before some changes had taken place. In parts it had grown decidedly longer by the falling of dead trees, which the Indian philosophically goes round instead of using his dull axe upon them. A marked climatic change was indicated

---

* 'The Rockies of Canada.' 1900.

† *Geographical Journal*, vol. xvii. p. 332.


Mt Brazeau 11000
10550
9100
9000
Poboktan Ra.
Poboktan Cr.
Poboktan Pass
Brazeau Lake 6200
5800
8600
Brazeau R.
Job's Cr.
Job's Pass
Mt Frances 9000
Canal Cr.
Roof Mts
Mt Stewart 10000
Cloister Mt
Cataract Pass
Cataract R.
Minster Mt
Mt Sentinel
Pinto L.
KOOTENAY PLAINS
SASKATCHEWAN R.
117°30'
117°
116°30'
52°30'
52°5'
MAP OF PART OF THE
CANADIAN ROCKIES
by
Prof. A. P. Coleman and Mr L. B. Stewart
Scale of Miles
5 0 5
Nat. Scale 1 500 000 or 7·9 miles-1 inch
Route
Glaciers
Heights in feet

by the much more powerful cutting of the streams, which had often destroyed the old trail, and had even chosen new channels through the woods, undermining the trees and making wild confusion of their tangled trunks. For several years the rainfall of Alberta has been much above the average, setting springs and streams flowing in what were formerly dry "coulees." It can hardly be expected that this abundant rainfall will be permanent, however. Our month was marvellously fine for the mountains, only one day being lost by rain, a record which may be contrasted with Collie's experience of continuous rain on the Columbia side of the mountains two years before.

As the earlier part of our route has been described before,* nothing further need be said of it, except to mention the unusual height of the Saskatchewan on August 11, when we crossed it. We found fifteen lodges of Stony Indians camped on the Kootenay plains near the foot of Sentinel mountain, but on the wrong side of the great river, which had not yet been fordable. As we passed they were just breaking camp in picturesque confusion, dogs barking, women taking down the canvas from the conical frame of poles, and looking up piebald or buckskin ponies to pack their household gods upon, and men putting their saddles on riding-ponies. After shaking hands with my old friend Jimmy Jacob, we secured Sampson Beaver to guide us over the ford, his sister, Becky, a bright-faced girl who talked some English, bestriding her horse and coming along as interpreter.

The river can only be forded where split up into numerous channels by low wooded islands, and before leading us over Sampson tried the ford himself, partially stripped so as to swim with his horse when he lost his course in the muddy water. He was a very lively and graceful bronze statue as he made his way across, but quite belied his name as far as physique was concerned.

Coming back, he led the way, and our band followed with no mishap, except that a pack-pony, edging too much down-stream, got into deep water and had to swim.

Our course now turned up Cataract river, following a poor trail seldom trodden of late years, scrambling down into canyons to cross tributary streams, but usually keeping on the rough talus slopes of the mountains, or along moraines hundreds of feet above the boiling river. The fine doublefold of Sentinel mountain stood just opposite us, and on ahead were splendid cathedral-shaped mountains, the most prominent of which we named Minster mountain. This peak is well seen from the prairie land of the Kootenay plains.

Instead of following up the west fork of Cataract river leading to Cataract pass, we took the north-west one through a wide unexplored

* *Geographical Journal*, vol. v., "Mount Brown and the Sources of the Athabasca," pp. 53–60.

valley, intending, if possible, to follow it to its head, and then seek a new pass to the Brazeau. Remnants of a very old trail showed that the valley had been entered by Indians, and teepee poles rotting on the ground at two points where there was some grass indicated their halting-places.

The trail can be followed only for short distances, and a good deal of chopping was needed to open a way for ponies, while at one place we had to lead them among the boulders along the edge of the river, here a raging torrent. To the north-east the valley was walled by an unbroken range of highly tilted mountains like a steep slate roof; but to the south-west the cathedral type prevailed with a gentler dip.

FOOTHILLS, LITTLE RED RIVER.

For 10 miles the valley is straight, following the strike of the mountains, but it then curves to the west, and the river splits into small creeks. Here we scrambled up a steep-wooded slope, and camped at 7200 feet, not far below timber-line. On the brow of a hill overlooking the valley and opening out a wide mountain view, we found several great springs gushing out and forming thick beds of travertine.

My brother climbed the mountain to the north-west, finding it to be 9000 feet high, naming it Mount Frances; and later we explored the main stream in the valley, following it up through a chain of lakes, the lowest at 7000 feet with forest-covered shores, then a very striking waterfall and a lake at 7500 feet, completely rock-enclosed, and fed by streams from a glacier a few hundred feet higher. Making our way around the cirque-like valley over very rough talus, we found another lake to the south-east just above tree-line, the most striking of them all, with blue-green water and a cliff 1500 feet high on one side. The lakes, though only three-quarters of a mile long, are as magnificent in their

way as Lake Louise near Laggan. All but the lowest one occupy rock-basins hollowed by small glaciers when the snow-line was lower than now.

Following a small stream north-west from the camp with our ponies next day, we soon rose above timber-line on our way to the lowest yoke of the mountain wall between the Cataract valley and the Brazeau. Though the rough small stones, uncovered with vegetation for the most part, annoyed our unshod ponies, we presently came to the foot of the ridge, and then scrambled up the slaty talus slope to its summit, where we had to decide whether to risk the unknown descent to the Brazeau or turn back the way we had come. The elevation of the yoke is 8600 feet, nearly 1000 feet above the highest pass we had crossed with ponies hitherto, and there was no sign of a trail suggesting that Indians had gone that way before.

From the ridge we had a glorious view of the mountains around, most of them from 9000 to 11,000 feet high, and carrying small glaciers; of the densely wooded valley of the Brazeau, which flowed about 2 miles off, but nearly 3000 feet below; and of Brazeau lake and the great glacier beyond it gleaming in the distance, the goal that we had set before ourselves in the beginning.

We quickly decided to risk the descent, and soon our ponies were slipping and stumbling down the steep slope, partly over soft snow-fields, but often over loose *débris* which rolled and slid beneath them. Reaching the valley of a snow-fed stream, we had rather better going, until this cut its bed down into a canyon, and finally plunged over a vertical fall of 100 feet or more. After trying in vain to pick a trail over the mountain, we at last led our tired and footsore ponies down the bed of the torrent, almost to the edge of the fall, and then made them scramble up to the right, where a small shelf gave a foothold to a few trees. From this it was easy to reach the forest slope, and as darkness fell we pitched our camp among the spruces, glad to have conquered, but not anxious to go back over the route again.

We were still 1500 feet above the ford of the Brazeau, near its forks, but two hours of steep descent among the trees brought us to the trail along the valley, the best beaten highway since leaving the Saskatchewan. Even here fallen timber gave us great trouble, but at last we reached the ford at 5830 feet, and turned up the valley of the north fork of the Brazeau to the lake of the same name. The trail is in better condition from the forks to the lake, and for 5 miles along the lake-shore than elsewhere; but from the delta of the north fork at the upper end of the lake, the trail is faint and hard to follow. Keeping to the left side of the valley, we came to a full stop about 6 miles up, a huge moraine of blocks of limestone as large as a cottage lying right across the valley. We were still several miles from the glacier, and it was necessary to get nearer it if possible.

At last a vague track was found among the boulders leading over the moraine, and beyond it an enchanting little valley with half a mile of prairie for the horses, thick groves of rather stunted spruces for fuel, and as a water-supply a clear stream leaping into the valley in a lofty waterfall, and ending in a pond without a visible outlet. Doubtless the pond drains through the moraine to the river below.

Our moraine camp was at about 7000 feet in what was probably the ancient river-valley before the moraine crossed it. Since that event the river has broken its way through, and cut an almost impassable canyon half a mile to the south. From this beautiful camp we had a broad view of the ice-field 4 miles to the north-west, and laid our plans for an attack upon it next day.

BRAZEAU SNOW-FIELD, FROM MORAINE CAMP.

We were rather late starting in the morning, having lost time in improvising alpenstocks from small spruces and steel nails, so that by the time the valley had been skirted and a rocky ascent climbed to the edge of the nearest glacier it was nine o'clock, and the sun was already strong. On our way we passed a very desolate lake half a mile long. The ice-field is broken by a long and very precipitous mountain ridge, the foot of which we decided to follow on our way up. The going was good for a mile on the bare glacier until the snow was reached, when the slope became steep, and the soft snow made very heavy walking. Tiring of this, we tried the mountain-side, but, after wasting some time, found it impracticable, and returned to the snow. At one o'clock we reached the top of the ridge which nearly cuts the snow-field in two, and found ourselves 10,000 feet above sea-level. The highest point of the mountain rose less than a mile to the north-west, but in very forbidding cliffs, so it was decided to attack it by a slope of snow on the south side. At our present elevation the snow was harder than

before, and the walking was fairly good, though we had to make a circuit round some large crevasses. Soon the slope became steeper, so that footholds were hard to make, and the surface, softened in the sun, begun to slip in great sheets beneath us, threatening to sweep us with it. Halting on some projecting rocks at 10,550 feet, we considered the situation, and concluded regretfully that further climbing was too dangerous to be risked. A clinometer reading from our earlier halt makes the top of Brazeau mountain, as it may be called, more than 11,000 feet, so that we were still several hundred feet below the top when we turned back.

From our perch on the rocks there was a magnificent view of the central Rockies, including the Columbia ice-field, and the bearings of a number of points were taken; but there were very few summits rising prominently above the rest, and we could not be sure of the mountains marked by Collie 20 miles to the south.

Immediately below us we had the Brazeau snow-field, 8 miles in length and 4 in breadth, rising into two white mounds towards the south, and sinking away to dirty surfaces of ice in the valleys to the east, followed by muddy torrents forming the headwaters of Brazeau river. Toward the north there was a profound and desolate valley, whose outlet we could not see, and to the west the green valley of Poboktan or Owl creek, a tributary of the Sunwapta, the eastern branch of Athabasca river. The Brazeau snow-field sends most of its drainage into the Saskatchewan and Hudson bay, but part into the Athabasca and the Arctic ocean.

The mountains toward the east were somewhat lower than toward the south and west, but almost every peak in sight carried snow-fields and glaciers; none of them, however, except in the far south, as large as the one we had traversed.

Glissading on the steeper slopes and wading through the soft snow on gentler parts, we made haste to reach camp before nightfall, but had one mishap before leaving the snow-field. I was in the lead, following our morning's footprints somewhat carelessly, when I plunged through the snow into a wide crevasse which we had crossed on the snow-bridge going up. Fortunately, my alpenstock crossed the chasm as I fell, partly supporting me, and my brother and Mr. Burwash tightened the rope and quickly helped me out of my uncomfortable position.

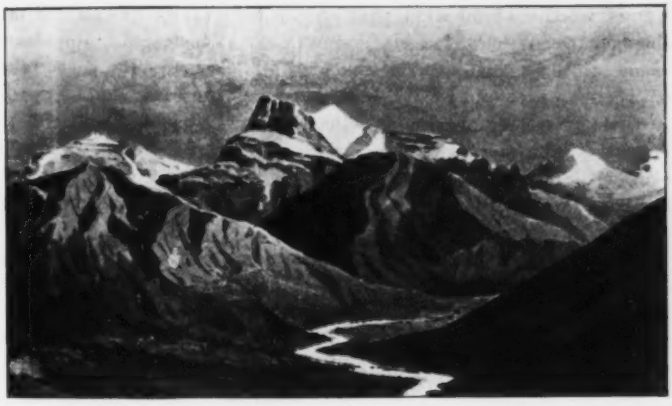
After more than eight hours on the snow, we were glad to reach the rocks again near the end of the glaciers, and, passing the small lake, made our way to camp just at dusk, where a splendid dinner of mountain sheep awaited us.

On the following day I waded several of the glacial streams and climbed to the lowest col towards the south-west, so as to complete my map. The route included 1½ mile of glacier and snow-field, and crossed a small nunatak, evidently not long free from *névé*, but lichens, mosses,

phloxes, daisy-like flowers, and a yellow composite are already growing on it. The col is at 9800 feet.

All the glacial tongues show signs of recession, a bare morainic belt reaching for a few hundred yards below; and the tree-covered moraine 4 miles away near our camp evidently indicates a much greater development of the ice some hundreds or thousands of years ago.

On our way back to Morley we followed up the west fork of Brazeau river and crossed Cataract pass, halting for a day to climb a mountain near the head of the pass, so as to complete our map of the region to the north-west. Our camp was at about 7000 feet, and the mountain, whose top is not more than three-quarters of a mile away, reaches above 10,000 feet. Unfortunately, an impassable cliff met us at 9830 feet on the west side



UP THE SASKATCHEWAN, FROM KOOTENAY PLAINS.

where we attacked it, and we were obliged to content ourselves with the view up and down the pass and across the opposite range toward the great snow-fields of the central Rockies. We named the point Mount Stewart, after our former companion, Prof. L. B. Stewart, who had prepared the original map of the region.

From Mount Stewart we made a start for home, with slow travelling on the bad trails to the Kootenay plains, but averaging 30 miles a day for the last four days, our ponies having by this time very light packs.

It is worthy of note that the mountain sheep, which have been little hunted of late years beyond the Saskatchewan, are becoming numerous and tame. We came within fifty yards of an old ram on the north-west fork of Cataract river, and had a close view of a flock of seven on our way up to the high pass toward the Brazeau. Another flock of five ambled away from us soon after we started our climb of Brazeau

mountain. Their khaki is splendid protection on rocky mountain-sides, but betrays them when feeding on green lower slopes.

In closing this paper, attention should be called to a statement made by Prof. Collie in the interesting account of his last work on the Columbia side of the Rocky mountains, that his previous explorations were on the *eastern* side of the Rockies.* In reality his excellent map covers only the central ranges, and there are several parallel ranges to the north-east, each somewhat lower than the former one, until the last, rising only to about 8000 feet, presents the great wall of rock toward the prairies from which the name Rocky mountains was derived. These north-eastern ranges have a width of 35 miles, as shown in the Brazeau valley, and include three or four ranges separated by lateral valleys to the north-east of Brazeau lake, the last point which he shows.

It is worthy of mention that on his map, as well as on the map published by Wilcox in his sumptuously illustrated 'Rockies of Canada,' through some oversight no credit is given for the parts taken from the map prepared by Mr. L. B. Stewart for my last paper,† though the whole of the region around Athabasca pass, Fortress lake, and the Brazeau and Cataract rivers has been copied from it, including passes and elevations. It is due to Mr. Stewart that his pioneer work should be recognized, when others who have done less work in the region are referred to as authorities.

I wish to say a word, also, in regard to nomenclature. The Canadian Pacific authorities have introduced the name Wapta for the Kicking Horse river, apparently unaware that Wapta is simply the Stony word for "river" in general, and should not be applied specifically to one of the minor rivers of the region. Collie has employed the name also for an ice-field near the source of one fork of the river. Finally, Wilcox uses the name Whirlpool river for the Sunwapta, or east branch of the Athabasca. As the same name has long been applied to a tributary coming into the Athabasca from the Committee's Punch-bowl to the south-west, it is evident that the new use of the name can only make confusion.

TRAVELS ON THE BOUNDARIES OF BOLIVIA AND ARGENTINA.

By Baron ERLAND NORDENSKIÖLD.

The boundary between Bolivia and Argentina is remarkable for its great diversity, as within a restricted sphere the traveller meets with vast tablelands, snow-clad fells, wild mountain valleys with luxuriant

* *Geographical Journal*, vol. xvii. p. 252.

† *Ibid.*, vol. v. No. 1.

primeval forests, enormous plains, overgrown with brushwood, etc. Thus far did the rule of the Incas formerly extend to the south-east. On the mountain plateaus lived people tributary to them, while independent tribes inhabited the mountain valleys and the Chaco. To this very day various Indian races live there, widely differing in origin, manners, and customs.

Varied scenery, innumerable fossils of pleistocene mammals, memorials of a prehistoric culture, and Indians—who had had little contact with civilization—were the inducements that enticed myself and companions to start for the spur of the Andes towards "El gran chaco." There were five of us—R. E. Fries, botanist; Count Eric von Rosen, ethnographer; G. von Hofsten, ornithologist; myself, zoologist; and E. Boman.

These parts have not been visited by many investigators. Those of most importance are Weddel, Crevaux, Lorenz, Hieronymus, Brachebusch, Uhle, and Borelli. Certain portions of this borderland, even if well known as regards geography, are in other respects but little studied, the least-known regions being often found in close proximity to civilization.

On March 25, 1901, Fries and I left Stockholm; von Rosen and von Hofsten not starting from Sweden till August 15, and joining us at Salta on September 25. Boman was a member of the expedition from May 8, 1901, till February 16, 1902, when he left on account of ill health.

As it is quite unnecessary to encroach on the space of this journal by any description of our voyage out, let me beg the reader to join us at Salta, a small town in North Argentina, which formed the basis of our excursions on the boundary between Argentina and Bolivia.

On May 12 Fries, Boman, and I arrived at Salta, chief town of province of same name, having 16,000 inhabitants. We at once began our preparations, engaging servants, procuring mules, provisions, etc.

This having been duly accomplished, we started from Salta on May 23, next day arriving at San Pedro, close to Esperanza sugar mills in Jujuy province, whence we rode towards the left to the northern extremity of Sierra Santa Barbara, which ridge here forms the last spur to the Chaco. So as to reach the sierra from San Pedro, we were forced to cross the Rio San Francisco, which river, not very far from the northern extremity of Sierra Santa Barbara, unites with Rio Bermejo and, bearing the last-mentioned name, flows on to Rio Paraguay and the Atlantic. To the west of Rio San Francisco there are several important places, but east of it only small settlers' huts and a tract that to my knowledge has hitherto been visited by no other scientist than Brachebusch, the geologist, who, in 1886, travelled through the most northern parts of the Argentine Republic, his mission being to study the occurrence of petroleum. Our knowledge of the geography and geology of these regions is all based on the results of his travels.

At Quinta, a small rancho in the primeval forest, we pitched our camp, and our scientific investigations were carried on either in its proximity, or during excursions in the neighbourhood. Near Quinta there are several hot springs, some with fresh, others with salt water. Some 3 miles off, or rather more, there is Laguna de la Brea, a small lake containing water, petroleum, and dissolved salts, flowing into it from certain springs. Animal life in the hot springs is very poor in species, but rich in individuals. Water of a temperature of close upon 50° C.* was inhabited by a small crustacean, an ostracode. Some of the hot springs at Quinta cause the formation of a lakelet, the water of which is saturated with salts. Animal life in the lakelet is far richer than in the springs, even as regards species, the number of individuals being very large. We found here a viviparous small fish, a mollusc (*Hydrobia* sp.), etc. It is very interesting to observe, in such a salt lakelet as this—which also has a supply of fresh, pure water—some forms of life which later on, in the struggle for existence, play a subordinate part, here, thanks to their being inured to the salts, developing in vast masses in the salt water. These forms, able as they are to exist under very different conditions of life, and proceeding from a large number of species, in all probability would continue to exist even if a general change were to occur of those conditions common to animal life in fresh and salt water.

Laguna de la Brea is devoid of macroscopic animal life. Vegetable life seems to be limited to one or two algæ, and a colony-forming bacterium. Microscopic animal life is likewise very poor here. Fresh water is rich in individuals, but not so rich in species as in Europe, probably because there are few large water-basins, and those there are offer but small variation of the outer conditions of life, thus giving little opportunity for the development of new species.

Quinta, as previously mentioned, is in the primeval forest, a lofty wood following the sierra, while at some distance from the ridge, the brushwood begins, the forest accompanying the more stony and the brushwood the looser ground. In the forest animal life is not so abundant as is fondly imagined on first reaching the tropics. We were at Quinta, however, during the dry season, when everything lies dormant, and the animals must be sought for in their hiding-places. The dry season here occurs in winter, but the hibernation of lower animal life is caused by the drought, and not by the relatively cold nights. In the damp meadows almost exactly the same abundant animal life prevails as during the rainy season: the snails here do not creep down into the soil and place a "dry-season lid" on their shells, as is the case in the forest and on the slopes.

* At this temperature there are numerous ostracodes, and at 51° C. some single individuals.

The Creoles had spoken to us of old dwelling-places, so-called "antigales" where treasure had vainly been sought. We made as systematic an investigation of them as the shortness of our stay permitted, and succeeded in bringing to light much that was of interest. These

SKETCH MAP SHOWING THE ROUTES OF BARON E. NORDENSKIÖLD IN ARGENTINA AND BOLIVIA.

dwelling-places are very numerous, and some seem to have been of importance. An armadillo (*Dasypus sexcinctus*) shows the scientist where such dwelling-places have formally existed, as, when digging its hole, the animal throws up pieces of pottery embedded in the soil. Nothing

above ground now testifies to where the villages have formerly been situated, except possibly the remains of some mound or other in the primeval forest. In all probability the culture of these ancient inhabitants was pure Chacensic, though greatly influenced by those Calchaquis living in the west. The most interesting discovery, made by Boman, was that of a burial-place, where, above the skeleton of a full-grown individual, five urns containing children's skeletons were brought to light. One of these urns had been taken out before our arrival, and was then in the hands of a settler. Some of the urns are said to have been broken by people digging for treasure. These urns are ornamented with fantastic faces. The children's skeletons are somewhat burnt. Among the ornaments are some specimens of a sea-shell (*Oliva* sp.), which has probably been obtained by barter from some tribes living in the west. It was a very usual thing with the Calchaquis to bury children in urns; but the burial urns used by the Calchaquis are different to those used here on the borders of the Chaco. Whereas the ornamentation of the Calchaquis is intricate, with fine, beautifully composed animal figures, here we found a plain, purely linear ornamentation. The Calchaquis ornaments are, as a rule, painted; while these are simply cut in the vessels. Another burial-ground was also examined, and there, among other things, we found a skeleton with a pipe-like object in its mouth. On closer examination this proved to be the upper part of a human humerus, from which the spongy tissue had been extracted.

Excavations of dwelling-places resulted in much that was of interest, proving that the art of modelling occupied a rather high position. As a general rule animal motives have been chosen. Ornaments seem mostly to have consisted of shells. Objects of copper are very rare. When the Spaniards conquered these and other adjacent tracts, it is probable that this slight culture—as Lafone Quevedo supposes to have been the case with the culture of the powerful Calchaquis—had already reached its culmination, and was on the wane. The dwelling-places all lie at some distance from water, which proves either that the streams have changed their courses, or that the rainfall is now less. Ten Kate made an almost similar observation in the Calchaquian valleys.

During our stay at Quinta, Fries and Boman undertook a long excursion over Sierra Santa Barbara; the alpine flora and various regions of vegetation were studied by our botanist. From Quinta we started for Esperanza, and after some delay on the road we finally arrived there on August 31. By far the larger number of the hands at this large sugar-mill are Indians, Matacos, and Chiriguans. They come from Bolivia and Chaco in search of food, and then get work. Indians are not bad workers. This contact with civilization, however, greatly demoralizes them; they are decimated by smallpox and a kind of galloping consumption. The mill-owners are Englishmen—Leach Brothers, known for having descended the Bermejo through the Chaco to Paraguay

After a time we returned to Salta, where we found von Rosen and von Hofsten. Having made final preparations with regard to fitting out the expedition, we left Salta for Puna de Jujuy. We chose the route through Quebrada del Toro, and not only in the Salta valley, but also in this quebrada, excavations were made. These quebradas leading to the tablelands are of a peculiar character. The rich vegetable life of the lower regions reigns part of the way, but by degrees the landscape becomes monotonous, columnar cacti being seen in vast numbers.

Our second headquarters were made at Moreno, about 11,500 feet above sea-level. The kind of rock prevailing round our camp was quartzite sandstone containing trilobite, and as this is much compressed,

OJO DE AGUA, PRE-COLUMBIAN PUEBLO IN QUEBRADA DEL TORO.

good fossils are rare. The vegetable formation is a "puna," a dry high-lying plain with low bushes. The central point of the puna contains a large salt lake or salt marsh, the shores bearing sparse halophyte vegetation. Animal life is very deficient, but comparative studies of the forms found here and those occurring in the valleys and the Chaco would doubtless prove of interest. High fells surround this elevated tableland, the highest being Nevado de Chañi, about 20,000 feet. The mountain slopes bear numerous cacti, many with beautiful flowers. The rainfall in the puna is very slight, the puna forming a closed water-basin. The streams are few in number and come to an abrupt termination. Much weathering is apparent, but the brooks simply carry down to the plain

fine silt and sand, leaving stones and gravel in the vicinity of the mountain, the salina only receiving the salts dissolved in the water. There are large fields of drift sand. The plain is so utterly devoid of large stones that, on seeing a stone in the immediate vicinity of the salina, you feel convinced that it is a stone axe or remnant thereof, or that very near there is the site of a dwelling, and that the stones have been brought there for building purposes. The central portions of the salina consist of common salt, while the outer, at any rate on the east side, are of borax. The salt crystallizes into visible layers, from which the Puna Indians hew out blocks of about 25 kilogs. in weight, two of these forming the ordinary burden of a donkey. These Puna Indians, the descendants of the ancient Omaguacas, then take the salt to the valleys for sale. In prehistoric times salt-mining must have been carried on here, judging from the large, heavy, broad-headed stone axes found on the shores of the salina. Similar stone axes—judging from what Chantre asserts—have been observed in salt-mines in Armenia, as also in mineral salt-mines of Austro-Hungary (Much). Borax occurs at times in streaks in the soil, but the really lucrative borax crystallizes in balls of irregular size, which are got at by digging and collected in sacks, like potatoes.

Evidently the Puna has never been covered by ice, as no moraines, no erratics whatsoever, are discoverable. When stones do intervene, they are invariably traceable to the brooks. Glaciers have existed in the Cordillera valleys lower down, as is evident. There erratics are seen high up on the rocky hills, where no water could have placed them. Enormous masses of material are found here, which, totally unsorted as it seems, is probably of glacial origin. Let me observe, however, that so close to the tropics such different conditions prevail to those of Europe that an unschooled geologist like myself cannot perhaps correctly comprehend those formations which are apparently glacial. Probably a tract free from ice has occurred in the Puna about 3500 metres above sea-level, surrounded by valleys filled with glaciers.

The Puna has formerly been pretty numerously populated. E. von Rosen examined two important dwelling-places, one at Casabindo, the other at Ojo de Agua, I myself making collections from some that were smaller. Casabindo is well known from the excavations of Max Uhle; also Ambrosetti and Lehmann-Nitsche has described a lot of interesting things at this place. Contrary to what holds good of those at Quinta, these dwelling-places are situated on those few streams and wells which never run dry the whole year, never in the proximity of those that are only available at certain times, which are far more numerous. This fact is a proof that no change in the rainfall has taken place since these spots were inhabited.

Casabindo has formerly been a very important place or town. Long after the invasion of the Spaniards an independent Indian culture reigned

in these tracts. In a grave in a grotto we discovered various purely Indian objects, as also a cow-horn. The dwellings have been built on the slope of the mountain, and each family has had their burial-place close to their hut, generally in a small cave. Vast terraces have been formed for purposes of cultivation. The climate of the Puna being very dry, numerous articles of wood and skin have been preserved to our day. The ceramic art has not reached so high a state of development as at Quinta. The ornaments are few, not graven, as is the case there, but painted. Many articles of skin and wood certainly owe their origin to the valleys, and have probably been obtained in barter for culinary salt. The Omaguacas (Humahuacas) were probably a tribe subject to the Incas,

THE VALLEY OF TARIJA.

but do not seem to have adopted their high degree of culture to any appreciable extent. Sea-shells were found in these graves also, as with the Calchaquis (Moreno). At Casabindo von Rosen obtained a large number of human skulls, most of them artificially compressed. Children's bones in perfectly unadorned urns were also met with here.

The Puna Indian of the present day is a Christian, but retains many heathen customs. He has a cross of cactus wood on the roof-tree of his grey stone hut, but outside the door there is a sacrificial altar to the earth-goddess Pachamama, to whom he constantly makes offerings and, in his heart of hearts, considers supreme. They now possess but few objects of their own original manufacture, but the stuffs woven by them

are of patterns with composite animal designs which denote an independent culture long since passed away. In the passes large cairns are constantly found, and every Puna Indian, on passing, adds a stone and a coca leaf, so that neither he nor his beast of burden may tire on the way. In some passes there are small squares of stone erected, into which the Indians throw their coca quids. There are some passes which they deem it impossible to traverse in safety without making an offering. I once tried to calculate the stones in such a heap, and found there were more than 50,000. Twigs ornamented with red tassels are also stuck into these heaps of stones, and domestic animals are adorned with similar twigs in honour of Pachamama. Evil places exist, and no Puna Indian ventures there, grottoes and high mountain-tops being reckoned as such. The grottoes at Quatchichocana have been in such bad repute that a priest had to come and exorcise the evil spirits. Sleeping in the vicinity of the Pachamama stones is considered dangerous, as spirits reign supreme at night.

At a place called Organoyo, von Hofsten ascended a mountain in spite of protests from the Indians. As he placed his foot on the topmost peak of this mountain, one of our mules fell into an abyss and perished. However, it is not always Pachamama that is the avenging goddess. In the slopes round Tarija (*vide* coming pages) it sometimes happens that some one falls over a precipice; the Indians then declare that this is the work of evil spirits, and verily they must be numerous, since every precipice has its own special presiding spirit.

Many peculiar customs obtain with respect to the harvest. In Tarija, for instance, where the population, though somewhat mixed, is closely allied to the Puna Indians, when harvesting begins, a cross is set up in the maize-fields, and on it all maize-spadices growing as twins are hung. These are called Pachamamas, and bring good harvests. The Puna Indians are industrious, though dull witted, unreliable, unexpressibly dirty, and never take a bath.

Numerous excursions were made from Moreno to most parts of the Puna. Nevado de Chañi (20,000 feet) was climbed by von Rosen, Fries, and von Hofsten. They reached the summit, and there found the remains of two altars or something similar, round which there were some pieces of earthenware, a bead of blue-green mineral, and—on and around the altar—a supply of cactus wood, etc. The so-called altars were built square, one side being open, and placed sideways with regard to their mutual position, thus not directed towards any special point of the compass. On one of the fragments of pottery a wedge-shaped ornament was painted. Similar patterns had been observed by von Rosen on pottery from Ojo de Agua, as previously stated, a large pre-Columbian dwelling-place at Quebrada del Toro. Beads of a similar kind are invariably found in all places and burial-grounds. The wood lay both inside and piled round the walls, and—probably owing to the

air at this elevation being peculiarly free from bacteria—it was in a very good state of preservation. Evidently this had been an ancient place for sacrifice or signalling, prior to the invasion of the Spaniards. At the top, consisting of granite, Fries collected lichens.* The flora was poor above the snow-line, which was at about 18,400 feet. A butterfly was found on the snow. Another excursion undertaken by Fries, von Hofsten, and Boman was pushed as far west as Puna de Atacama.

On November 25, for purpose of equipment, von Rosen, Boman, and I

CHOROTE INDIAN, BOLIVIAN CHACO.

returned to Salta through Quebrada de Pumamarca. We left Salta on December 18, Boman going *viâ* Quebrada de Pumamarca so as to join Fries and von Hofsten in Moreno, while von Rosen and the author of these lines travelled through Quebrada de Humahuaca. At an Indian hut we tried to induce an old woman to sell us a "piedra del raye," or thunderstone. It surprised me that the Indians of the Puna did not

* The spot reached by von Rosen, and which was then deemed the highest peak of the mountain, lies north-west of real summit, where the mineral is quartzite sandstone.

regard the arrow-heads as supernatural, but simply considered them as derived from the ancients, their forefathers. That which the Indians call thunderstone consists of pieces of red hematite. They are met with in the old dwelling-places, and the belief in their having come with thunder is prevalent among all the Indian tribes in these parts, as also among the Creoles. Probably this idea has originated from meteor stones having been observed to fall at one time or other, and therefore it has been supposed that all stones with the habitus of meteor stones have a similar origin. The old woman refused to sell her thunderstone, declaring that she pulverized it and used it as a remedy for rheumatism.

At Cangrejillos, near the Bolivian frontier, we all met and started for Bolivia, arriving on January 8, 1902, at Tarija, camping in the vicinity of the town. The valley of Tarija, famous for its fossils of pleistocene mammals, is about 6200 feet above sea-level, the surrounding mountains being some 10,000 to 13,000 feet in height. The trees are mostly mimosas, though, in damper places, other kinds of trees occur, cacti being very numerous.

As previously stated, Tarija is famous for its fossil mammals. Weddel was the first to make collections, when, in the capacity of botanist, he visited this valley in 1875. He obtained a vast number of fossils, and, after unheard-of difficulties, succeeded in transporting them to Paris, where they now are, having been duly classified and described by Gervais. An essential part of the material which formed the basis of Burmeister's palæontological works was also derived from this region.

The soil of the Tarija valley consists of fine dust, with belts of sand and gravel. Water has intersected the valley in all directions, forming the most fantastic landscape, with rifts and labyrinths. In the upper strata of the soil, the water has in many places brought fossils to light. Our work here was crowned with success, as we obtained skulls and skeletons of various forms, especially of *Mastodon andium Equus curvidens*, and of some giant edentates—*Megatherium americanum*, *Mylodon robustus*, *Lestodon armatus*, *Glyptodon clavipes*, and *Scelidotherium capellini*. Good material for studies on the individual and sex variation of the *Mastodon andium* was obtained, as also of *Equus curvidens*. These forms are especially interesting, since they emigrated to South America at a rather late period, and it is possible to follow a parallel in development and obtain material for comparison with contemporary or almost contemporaneous forms in North America and Europe. Besides the fossils already mentioned, we came across parts of the skeletons of *Hippidium principale*, *Eutatus* sp., *Dasypus* sp., *Auchenia* sp., *Macrauchenia patagonica*, *Machærodus næogeus*, etc.

In Tarija man has evidently not been contemporaneous with the mastodon and other gigantic animals. When factors of species and bones of fossil mammals are met with together in these regions, a

secondary admixture is always traceable. This is what has occurred in the grottoes of Ultima Esperanza in Patagonia, but, curiously enough, those that examined this grotto after my investigations have failed to comprehend this fact. During the time of the Incas, a very high degree of culture obtained at this place. Von Rosen succeeded in making very good finds at the dwelling-places, more especially of arrow-points of chalcedon and obsidian, as also of spindle discs and animal figures cut in potstone. Objects of copper or copper admixtures were common,

ON THE ROAD TO CREVAUX.

having probably a purely Incan origin. Ornaments, amulets, beads, etc., were of stone, whereas at Quinta they were of shell, as now used by the Chaco tribes.

On February 24, 1902, we left Tarija for the Bolivian Chaco, the route lying across the fells; vegetation was very varied, the most glorious primeval forests and sombre highland fells being traversed. In these mountain valleys we learnt to know the Chiriguan Indians. As is well known, they speak Guarani, and come originally from the east.

The Puna Indians have formerly spoken Quichua. These Chiriguans live in nice little huts, which they keep beautifully clean and tidy. They bathe and wash constantly; sowing a little maize, which forms their chief food, and drinking inordinately of chicha, an intoxicant prepared in a disgusting way from maize. The Chiriguan bores his nether lip, wearing between it and his chin a button "tembeta," set with small beads cut out of stone. Boys begin wearing these when arrived at the age of puberty; at first they have only a small plug of wood, which most of them afterwards exchange for a metal button. Their sole independent art is limited to pottery. The pots are adorned with rather pretty ornaments of curved lines, which, however, do not offer much variation. They bury their dead in giant pots, as is usual with the Guarani people. These pots they bury in a corner of the rancho, which—at any rate, on the death of the master of the house—is set on fire. This manner of burial will, of course, soon disappear. I have myself dug up a double pot containing a skeleton, which it was stated had been buried in 1899. It cannot have been much longer ago, since in the spring of 1902 there was a perceptible smell. These Indians generally live as monogamists, though the chiefs, at any rate, take a new wife when the first loses the charms of youth. They are said to believe in a life hereafter—in fact, a very jolly life, with plenty of drink and women galore.

On March 13 we arrived at the Aguayrenda mission station, and on the 15th instant set up our camp at Tatarenda. This place is within a woody region forming a transition from the damp highland forest and the dry wood of the Chaco. The rainy season was now almost at an end, both animal and vegetable life being most abundant. At Tatarenda I made several experiments with luminous insects. They are very numerous hereabouts, and show great divergence in luminosity. For instance, there was an elateride caterpillar (previously observed by Holmberg in north-eastern Argentina), the head emitting a red light, while each segment was provided with two spots which, like the final segment, emitted a green light. The red glow was constant, the green interrupted at intervals. What possible advantage could be derived by the caterpillars from this light? They have no gain in enticing other individuals to their side; nor can the purpose be that of frightening their enemies, as the light would not then be extinguished so soon as the caterpillar is disturbed.

Not far from our camp, a tribe of itinerant Chorote Indians had encamped on the borders of a palm wood. We, and more especially von Rosen, soon became good friends. They came to our camp, brought all sorts of animals for our collections, offered us their ornaments, etc. It is wonderful how well these Indians are acquainted with their primeval forest, with its innumerable insects. I wished to get several specimens of a luminous elateride caterpillar whose manner of glowing was interesting, evening after evening searching for it, but in vain. Finally, I

showed a couple of Indians the larvæ, and after a short time they came back with many specimens. I did exactly the same at Quinta, so as to obtain a fly-caterpillar, some Mataco Indians being my helpers there.

The Chorotes are a very primitive race living on the south side of Rio Pilcomayo, like other itinerant Indians of the Chaco, subsisting on fish and wild fruit. Their huts are small, round, and thatched with palm leaves, the domestic utensils consisting of a few coarse earthenware pots and mussel-shells. They weave cloth of the bast of a bromelia, the so-called Chaguar (*Bromelia serra*); adorn themselves with conch shells, beads, and feathers, and wear large pieces of wood set in their ears. They obtain fire with wooden sticks. Their weapons are bows and arrows. The arrow-heads are of hard wood, being frequently barbed. Though the Chiriguans in the mountain valleys have access to stone, which is not the case with these Indians of Chaco, their arrow-heads are of wood. In the pre-Columbian dwelling-places at Quinta, on the borders of the Argentine Chaco, you never find an arrow-head or even a stone which seems to have been used as such, whereas in the Puna and in Tarija, von Rosen collected several thousand stone arrow-heads and, at the dwelling-places, the ground was strewn with chips, which were evidently caused by their manufacture. Probably the prehistoric Indians at Quinta had arrow-heads of wood.

At Tatarenda I made various experiments with a myriapod developing cyanogen. These insects are already known to entomologists. The gas produced by a few specimens of this myriapod killed a frog in little more than ten minutes, insects dying in far less time.

From Tatarenda we rode on to Crevaux, on the Rio Pilcomayo. The Bolivian Government placed an officer and eight men at our disposal for this excursion, of which force, however, we only partly availed ourselves. The road from Tatarenda to Crevaux takes two days and a half, and runs through thickets. The Bolivian Government has built a small fort at Crevaux, and stationed a slight force there as protection to the settlers against the Indians. The vegetation around Crevaux consists of a dry thicket without any other vegetation beneath it, a wood in which it is fatal to lose one's way, since it is very difficult to penetrate, and there is no water, even a few days after a rainfall. The ground consists of fine dust, and at Crevaux there is not a stone or a grain of sand.

The most important rivers flowing into the Chaco are the Pilcomayo and the Bermejo, which, though greatly reduced in size, reach the Rio Paraguay. Other streams and rivers lose themselves in the Chaco. Close to the mountains, they deposit stones and gravel, and simply carry fine silt out into the Chaco. A river like the Pilcomayo has no determined course, but in the Chaco divides and distributes itself in swamps at random. During the rainy period these rivers, having an abundance of water, deposit vast masses of sludge; during the dry

season, the quantity of water being greatly reduced, the sludge deposited by the river turns into dust, which, blown about by the wind, is spread far and wide.

The loose soil of the Chaco seems to me, as previously stated, to be formed of sludge deposited by the rivers and afterwards transported by the wind. It is scarcely probable that sediments carried through the air from distant parts should form any considerable portion of these deposits. Sections made through the earth strata of the Chaco prove it to be loose, characteristic, unsifted, porous dust, full of the shells of numerous land-molluscs.

In order to comprehend how enormous masses of sludge can be carried along by the rivers, we must duly consider the rainfall. Whereas in the north of Europe it is only during spring that the streams transport any large mass of solid material, the rivers of South America are thick with sludge during the entire period of the rainy season. Storms are also far more violent in these regions than in the north of Europe. On the route to Quinta from Salta, the Rio San Francisco is crossed. I have traversed it when there was but little water; this same river, however, annually claims some victim among those who ford it at flood-tide. A rider, wishing to cross the river after rain, perished in the attempt, and all that was ever found of horse, rider, or saddle was a saddle-bag, everything else had completely vanished. The great difference in elevation also favours this accumulation of silt in the Chaco. The rivers come from a height of several thousand feet, with an exceedingly abrupt fall into the Chaco, where the further flow has a very slight descent.

At Crevaux we had some contact with the Tobas and Matacos (*Noténes*)—tribes whose manner of life and belongings resemble those of the Chorotes, who are, however, more given to gaudy trinkets than the Matacos, though far more cleanly and of brighter disposition.

With our excursion to Crevaux the programme laid down for the expedition was finally accomplished. From Crevaux we wended our way back to Tatarenda, and followed the spur of the Cordilleras as far as Bermejo. On approaching the sierra the route lies through high-stemmed primeval forests; farther on the low thickset dry wood appears that is typical of the Chaco. During our march we obtained some Indian skeletons. On May 13 we reached the Esperanza sugar mills, arriving at Salta on May 17, whence we returned *viâ* Buenos Ayres to Sweden, where we landed on June 27, 1902.

Briefly stated, the chief results of the expedition were as follows:—

Collections of fossil mammals from Tarija.

Botanical, as also zoological studies and collections made in a district of very varied nature, collections which we trust will be of use, not only for purely systematic studies, but also those in phytogeography and zoögeography.

Ethnographics from the following Indian tribes: Omaguacas, Chiriguanos, Matacos, Chorotes, and Tobas.

The discovery on the borders of the Chaco of dwellings and burial-places belonging to a pre-Columbian culture, which, even if not of very great importance, is of interest, since it appears distinct from any previously known from these regions; showing, moreover, many individual peculiarities, evidently derived from inhabitants of the plains.

Excavations of ancient dwelling-places at Puna de Jujuy and the Tarija valley, and studies connected therewith as regards the limits of the power of the Incas towards the south-east.

A collection of skulls and skeletons both from a period of culture long since past, as also from living Indian tribes. This should provide material for comparative studies of scientific interest.

Furthermore, let me mention the indigitation of pre-Columbian salt-mining in Salina grande in Puna de Jujuy, an industry which has probably been an important factor in the trading between the various peoples.

Finally, as a curiosity, there is the pre-Columbian place of sacrifice, or signalling station, on the summit of Nevado de Chañi, 20,000 feet above sea-level.

'ANTARCTICA.'*

By HUGH ROBERT MILL, D.Sc., LL.D.

ANTARCTICA is the hypothetical Antarctic continent, and Mr. Balch seems to have set out in his task of discovering its discoverer with the determination that this discoverer must be an American. The motive is patriotic rather than scientific, and the work altogether savours of special pleading, in the course of which the evidence is not always quite fairly interpreted, and is sometimes not clearly understood. Apart altogether from motive and interpretation, the work which has gone to the making of this book has distinct value as a piece of bibliographical research, and the book reflects the greatest credit on the enthusiasm and perseverance of the author. In noticing his arguments, we wish at the outset to make it clear that we cannot allow the first premise, viz. that the existence of the Antarctic continent as a geographical unit has been demonstrated, and therefore we think that the claims of people of any nationality are at present of minor importance.

* 'Antarctica.' By Edwin Swift Balch. Philadelphia: Press of Allen, Lane & Scott. 1902.

We do not consider that the magnificent demonstration afforded by Cook and Bellingshausen that the fabled Antarctic continent was a myth was less brilliant as a geographical achievement than if one or other of them had proved that continental land lay within the Antarctic circle. Since Bellingshausen was unquestionably the first navigator to discover land in the Antarctic regions, strictly so called, the credit of the first discovery rests with Russia, for the same reason that the credit of the discovery of America rests with Spain. If an American could be shown to have seen Antarctic land before Bellingshausen, we should welcome the fact and praise the feat quite as warmly as if the hero were a British subject. Mr. Balch surely does not need to be assured that no British geographer would dream of withholding credit from any explorer on the ground of his nationality, least of all if that nationality were American.

As regards nomenclature, Mr. Balch uses the word "Antarctica" to express the mass or masses of land in the neighbourhood of the south pole, as first employed by Mr. J. G. Bartholomew. He uses the expression "the Antarctic" to include, in addition, the sub-antarctic islands, even going as far north as Bouvet island and Kerguelen. He criticizes the subdivision of the Antarctic area into quadrants by Sir Clements Markham, but does not show any reason for supposing that the use and nomenclature of these quadrants was more than a temporary expedient to assist contemporary exploration, so that this point need not be entered into.

Mr. Balch goes very fully into the beginnings of speculation and exploration as to the Antarctic regions, citing his authorities with much care. On the vexed question of the land found by Vespucci, supposed to be in 52° S., he considers that this land was South Georgia. A vast amount of labour is given to a discussion of the charting of the southern extremity of South America from Ruysch onward; but the real interest of the book begins with the advent of Dirk Gerritz. Following Ruge and Wichmann, it is, of course, impossible to support the claim of this Dutch sailor to have discovered the South Shetlands, or to justify the use of his name to designate that region. But Mr. Balch has seen in the Royal Archives at the Hague the manuscript of instructions for the voyage of the Nassau fleet in 1623–26, containing depositions of two members of the ill-fated expedition of the "five ships," both of whom were shipmates with Dirk Gerritz on the *Blijde Bootschap*. These are cited in Dutch and English. Jacob Dircxz states definitely that that unhappy vessel was driven south only to 56° S. Laurens Claess, after the loss of his ship, served with the Spanish admiral Don Gabriel de Castiglio on the coast of Chile, and declares that in 1603 he went to 64° S., "where they had much snow," but made no mention of land. As Wichmann pointed out when he discovered the document, this is doubtless the origin of the vague story which attached itself

to the name of Dirk Gerritz; but Mr. Balch keeps to the opinion that some one had seen mountainous land in 60° S. at the beginning of the seventeenth century.

On page 72, after a brief sketch of Cook's epoch-making second voyage, our author states, ". . . Antarctica was not discovered, a fact which would seem to rank the voyage of Cook as of much less importance than the voyage of Wilkes." If such extraordinary reasoning were to be allowed, one might say far more justly of the first transatlantic voyage, ". . . North America was not discovered, a fact which would seem to rank the voyage of Columbus as of much less importance than the voyage of Cabot."

In dealing with events subsequent to the voyage of Cook, Mr. Balch does not refer to the very extensive sealing trade which attracted a great number of British sealers to South Georgia before American competition began; but he quite rightly devotes a considerable amount of space to the doings of the American sealers from 1800 onwards, because, although their British competitors were probably always the more numerous, the Americans were the more communicative, and possibly the more prosperous.

Captain Fanning's story of the meeting of his companion Captain Nathaniel B. Palmer with Bellingshausen is one of the most picturesque pieces of that fine old sailor's remarkably picturesque book. Mr. Balch points out quite correctly that M. Arctowski states that the meeting is also referred to by Bellingshausen. So it is, but Fanning's details are not confirmed. Bellingshausen only refers to the statistics of sealing given to him by Palmer. He could not have accepted Palmer's offer to pilot him into Yankee harbour in Deception island, for his chart of the South Shetlands shows that island without any internal harbour; that he had seen it from some distance is, however, made clear by the fact that a part of the coast is dotted in—no doubt the break in the crater-wall which forms the entrance to Yankee harbour. Bellingshausen called Deception island Tiele island, as a compliment to the Russian consul-general at Sydney, who had told him of the discovery of the South Shetlands. Mr. Balch accepts Fanning's statement that Bellingshausen named the land reported by Palmer south of the South Shetlands Palmer Land on the spot, and "by this name it is recorded on the recent Russian and English charts and maps which have been published since the return of these ships." Fanning's book was published in 1833, only two years after the appearance of Bellingshausen's book and atlas, in neither of which is Palmer's name given to any land, nor is the existence of any land between the South Shetlands and Alexander Land referred to in any way. It is obvious that either Bellingshausen suppressed most important facts, or that Fanning gave an exaggerated report of the interview with Palmer. In any case, Bellingshausen can hardly be cited in corroboration of Fanning's story

Fanning's services to Antarctic exploration were none the less of great importance, and Mr. Balch rightly claims for him and Powell the credit which is their due. Powell's chart of the South Shetlands, published in London in 1822, and reproduced in the book, is probably the first on which the name of Palmer Land appears, and the name was apparently given by Powell, not by Bellingshausen.

Morrell's book of travels is, we doubt, taken too seriously by Mr. Balch. We know no romance of the sea that is more amusing reading on account of the highly imaginative atmosphere in which the boastful mariner lived and moved. Probably enough he did make a voyage in high latitudes; if he sailed westward from south of Kerguelen, he might conceivably have followed the particular track with which his name is associated, but as evidence in any question of priority of discovery we consider Morrell's book to be absolutely worthless. Reynold's statement as to the high latitudes made by American sealers on the coast of Graham Land before 1828 is more satisfactory, but there are no particulars to give it the status of positive evidence.

Mr. Balch allows that "there appears to be no doubt that Balleny had a glimpse of the mainland of East Antarctica," yet he claims for Wilkes the credit of *first discovery*. The matter is unimportant, as Wilkes knew nothing of Balleny, and had written orders from home to explore that part of the Antarctic region in which he discovered land a day or so before it was also discovered in the same place by Dumont D'Urville. It may be that Wilkes has not always received due credit in this country. His courage in conducting a dangerous voyage with utterly inadequate ships and equipment deserves high praise. Giving Wilkes full credit for sighting points of land behind a long ice-barrier, and allowing that he called that land the Antarctic continent, we cannot see that he either proved that continent to exist or was the discoverer of it. It might be a chain of islands locked up by ice, and, if sighting points of that chain constitutes discovery, Bellingshausen and Balleny must come first. Ross proved that there is a vast extent of very high land south of the Antarctic circle, but the evidence that it is in the geological sense "continental" was first furnished by Sir John Murray, based on the discussion of the sediments collected by the *Challenger*, and since strengthened by the rock specimens obtained by other expeditions. In the geographical sense the Antarctic continent has not yet been discovered, unless indeed the *Discovery* and the *Gauss* have done so in the present century.

Mr. Balch, we fear, overestimates the importance of a traveller's assertions or beliefs, and underestimates the amount of proof required to substantiate them. When he says that "Bouvet and Kerguelen were disbelieved in and sneered at, nevertheless their discoveries have stood he test of subsequent exploration," he is only half right. Subsequent exploration showed merely that they had seen land; their own "dis-

covery" in each case was the Antarctic continent, and poor Kerguelen was himself the unhappy discoverer of his own mistake.

Mr. Balch is unjust to the memory of Sir James Clark Ross, though the latter may have been unduly hard on Wilkes in discrediting his discoveries. We feel sure that Ross was not aware of Wilkes's orders dated 1838 at the time he wrote of the American and French expeditions, "that the commanders of each of these great national undertakings should have selected the very place for penetrating to the southward, for the exploration of which they were well aware, at the time, that the expedition under my command was expressly preparing, and thereby forestalling our purposes, did certainly greatly surprise me." But Mr. Balch is not aware that D'Urville had no orders for his second Antarctic voyages, but set out avowedly with the object of forestalling Ross and securing the honour for France. He had a perfect right to do so; but the knowledge of the fact that he had acted in this way is sufficient foundation for an expression of irritation. The judgment quoted by Mr. Balch as passed on Ross by Dr. J. W. Gregory, "But Ross's range of interest was narrow; he did not land on the mainland he discovered, and would not let his doctor, McCormick, . . ." also rests, we believe, on imperfect information. Ross's interests were perhaps too wide, for he was an enthusiastic natural history collector as well as an accomplished magnetician and an able commander. It was his duty to think first of the safety of his ships, and the incident as to forbidding the landing of Dr. McCormick assumes a different complexion when it is known that by the rules of the service one medical officer must always be on board a man-of-war, and that on the occasion when Dr. McCormick begged in vain to be allowed to land (as stated in his own book, vol. i. p. 162), it was Dr. Hooker's turn to go ashore. Science lost nothing on that occasion by Ross's refusal to alter the equitable arrangement for the doctors to land alternately.

Mr. Balch has done a patriotic service, and also a service to science, in setting out the real achievements of Charles Wilkes, and he has succeeded in bringing together a large number of references to Antarctic literature, some of which did not appear in the hastily compiled bibliography of the 'Antarctic Manual.' He has also corrected an error in that bibliography, due, by the way, to a transcript without verification from an American journal, and for this we are grateful.

THE LAKES OF THE BALKAN PENINSULA.*

By Dr. KARL PEUCKER, Vienna.

In the atlas of the lakes of the Balkan peninsula, just published, Prof. Cvijić has filled a distinct gap in our knowledge of the lakes of Europe. The atlas forms the cartographic section of his great lake studies, of which the literary part will appear in the course of this year. Some of the main results of his researches into the forms of lake-basins and their origin have already been communicated to the *Journal*, and provisional bathymetrical maps have been published of the three largest of the ten actual lakes mapped in the atlas (the other lake-basins represented are marshes). The atlas contains the final maps, on the scales of 1 : 100,000 and 1 : 75,000, with full detail and distinctive colouring. Following the example of the atlases of the Austrian lakes and the maps of the English lakes which have appeared in the *Journal*, both the lakes and the country surrounding them are contoured and coloured in appropriate tints. The map characteristics also disclose an abundance of new facts. Places covered with reeds, steep rock slopes, and more particularly the remains of ancient shore-lines, are clearly indicated. A special map, worked out in admirable detail, shows the neogene extension of the lakes of the peninsula. The present lakes are clearly relics of the large and deep lakes of the beginning of the Tertiary period, surviving from the general drying up of the region. Only the Ohrid and Scutari lakes, as laid down from the excellent surveys of the Austrian officers, show the original forms in their present outline. The detailed new surveys of the Servian savant have revealed important and hitherto unknown features in the western and south-eastern parts of Lake Prespa; the form of the Kastoria lake, and of the two lakes of the Chalcidice peninsula, and the position and form of the island of Scutari, have been considerably modified. The soundings, given below in Table B, although not as numerous as those taken in the lakes of Central and Western Europe, are quite sufficient to indicate fully the relief of the basins; the network of soundings is open where the bottom is uniform, and close where it is irregular. Only by this method was it possible to find the deep holes in the bed of the Scutari lake already mentioned, or a sub-lacustrine river-bed in the Ohrid lake. In places the lake-bed is represented by isobaths 10 metres apart; in others the vertical intervals are 5 metres and 3 metres; and in shallow lakes, or in regions of complicated form, 1 metre, coloured in four shades of blue. The distribution of temperature in the water of the Ostrovo lake is shown on a special sheet by means of curves. The "limnometric values" for the different lakes, given in the tables appended, are brought up to date by the addition of some republished figures, and the numbers are here converted to English measures. The last two sheets of the atlas give a special graphic representation of the numerical values, worked out by the writer of this article, in which the relations of form and size of the lake surfaces and basins are clearly depicted.

In the tables the lakes are arranged in order of size, beginning with the smallest, the Yannina lake in Epirus, with an area of 18·8 square kilometres, or 7·3 square miles, and ending with the Scutari lake, with 356 square kilometres, or 137·6 square miles—a range equivalent to the distance from Loch Rannoch in Scotland, or the Walchensee in the Bavarian Alps, to Lough Neagh in Ireland, or the Lake of Garda in the Italian Alps. The Yannina lake is the smallest of the ten, but the Kastoria lake is the shortest. The Scutari lake is both the largest

* 'Atlas der Seen von Makedonien, Altserbien und Epirus.' Von Jovan Cvijić-Prof. a.d. Kgl. Universität in Belgrad. Ten sheets in portfolio. Belgrad, 1903.

and longest; the second in size, Lake Prespa, has the greatest mean breadth. The tabular values for length and breadth furnish a new definition of the "length" of a lake; it appears for the first time as the shortest line measured along the water surface between the two most distant points of the shore. This line admits of precise construction, and has a distinct significance in relation to commercial geography as the shortest line of communication between these two points. In lakes having a curved outline—valley lakes, etc.—the "length" is a broken line, compound from tangents on the curves of the shore; otherwise it is a straight line identical with the "air line." The limnometric sheets of the atlas also furnish a new and precise idea for the determination of "articulation" (*Gliederung*), a conception which has been the subject of endless discussion in German geographical literature since Karl Ritter. According to this the Dojran lake, east of the Vardar valley, is the least articulated; it has only five inlets, forming together about 4 per cent. of the total area. The Beshik lake is the most highly articulated; its exploration, and that of the sister lake, Lake Ajvasil, has been very fully carried out by Jankovic, a pupil of Prof. Cvijić; we find that its seven inlets make up 48 per cent. of the total area, or nearly one half. On the other hand, the Ohrid, Ostrovo, Prespa, and Scutari lakes have a greater number of articulated members, but the total area of these members is relatively less; the inlets and bays in the Scutari lake include thirteen of the first order, eleven of the second, and nine of the third, but together they make up only 25 per cent. of the whole area. Its thirty-four islands, which, as in all these lakes, lie close to the shores, make up only 0·4 per cent. of the area. The bays formed by submerged river-valleys in the north-west and north-east of this interesting Montenegro-Albanian lake cut off large peninsulas from the surrounding land, which is thus also highly articulated by no less than forty peninsulas of the three first orders, compared with five in the Dojran lake. Of the five larger lakes only the Beshik and Ohrid have no islands, and of the five smaller only the Tannina and Malo lakes have any; in contrast to the Scutari lake, all have only one or two. The Prespa lake has absolutely the largest, the Malo lake relatively the largest, island area.

The soundings taken during the summer months of the years 1899 to 1901 have shown that the Malo lake is the shallowest, the Ohrid lake the deepest; the latter, with a maximum depth of 938 feet, is actually one of the deepest lakes in Europe, although not in relation to its size. Its volume nearly equals that of the Lake of Constance, more than seven times that of the Prespa lake, which drains into it subterraneously, and twenty-three times that of the Scutari lake. The other lakes, with the exception of the Ostrovo, are amongst the shallowest known. The Scutari lake is not more than 20 to 26 feet deep in the centre, and in the holes, which are of insignificant area compared to the total, the depth only attains a maximum of 144 feet ("Oko" of Raduš). The shallowness is also apparent from the slope-angles of the bottom, the values being mostly under 1°. The Ostrovo and Ohrid lakes are, on the whole, not so level; the mean slope of the latter is the same as of the Lake of Constance. The last sheet of the atlas gives a graphic analysis of these slopes, from which one can form an opinion as to the relations between surface and slope at various depths. Angles and surfaces are strictly comparable in "hypsoclinographic surfaces," which is not the case with "hypsoclinographic curves" like those published for the lakes of Central Europe.

In contrast to the land surface, the water surface of lakes gives a surface mathematically parallel to the form of the ideal spherical earth. This spherical form of the lake surface is an important characteristic of the whole type of geographical form, and its importance becomes apparent even in lakes of medium size. In the Ajvasil lake, 7 miles in length, the margins of the opposite eastern and

western shores would lie hidden from one another were it not for well-known optical phenomena: a wall of water rises 8 feet above the straight line of the lake. This is an important limnological fact in the discussion of optical questions. It is only possible to see across the three smallest of the lakes dealt with here in all directions; in the three largest one cannot see from shore to shore in the broadest places. On the Ohrid the wall of water rises 10 feet, on the Scutari over 17 feet, on the Prespa 20 feet. Longitudinally the height is five to six times as great in these lakes, and on the Scutari lake the height is 100 feet. It follows that the share of the spherical segment in the total volume of water increases with the size of the lake; the height of the arc is a function of its area. In order to obtain trustworthy values, the irregularly bounded spherical segment of the lake surface must be replaced by a segment of equal area having a regular boundary.

The relation between the depth and area of a lake is a factor whose importance must not be underestimated in the discussion of questions relating to its origin. The relation of the volume of the spherical surface segment to the total volume of the basin is the same as that of the mean height of that segment to the mean depth. The former corresponds to the area, as has been seen; but we have now, for the first time, rational values for this important relation in the new conception of "relative depth," an expression analogous to the "relative height of mountains," and to the relation between mean breadth and length employed by British limnologists, and there called "relative breadth." It is interesting to note how, in the Scutari lake, the segment and volume nearly coincide (1·06), and how Lake Prespa, which is mostly over 60 feet deep, is relatively shallower than most of those of the ten lakes which are absolutely shallowest. It is not surprising that the deep Ohrid lake has a relative depth of over 43, but it is remarkable that this value is more than double those for the larger lakes of Constance and Geneva, nearly double that for the Lake of Neuchatel, and considerably greater (29 : 43) than that for the slightly larger Lake of Garda.

The last diagram in Cvijić's atlas gives an instructive picture of the elevation of the ten lakes, and of the general form of their basins. If one regards the chief point of contrast in the form of the basins as depending on whether the curvature from the margin at the deepest part is concave or convex, the formula given in one table, and already accepted by some limnologists, gives the criterion required according as the values are positive or negative. The positive values indicate a basin which contains more water than a hollow cone of the same basal area and depth, and the negative values one which contains less, and the numbers give the actual relation to the cone. The high positive values for Dojran and Ajvazil show that the general form of their basins is that of a truncated zone; those for Ohrid and Malo indicate a trough shape (hollow segment), and intermediate between these we have the Beshik. In the other lakes the bottom does not run down evenly, but shows varying depths. The slope is, on the whole, approximately a tangent to the general curve, the curvatures near the margins and in the depths neutralizing one another so far as the effect on the volume is concerned; thus the numerical values work out nearly to zero, the value for the theoretical hollow cone. This is especially the case in lakes Prespa and Kastoria, and also in Tannina and Ostrovo. The numbers below zero indicate lake-bottoms with convex slopes, where the incline in the depth is markedly steeper than round the margin, or is funnel-shaped; this form is prominent in the Scutari lake. While the trough-shaped Ajvasil holds two and a quarter times as much water as the simple conical form, the value (−0·67) for Scutari shows that that lake only holds one-third as much.

A.—Surface of Lake.*

Lake.	Scale of map.	Elevation of surface above the sea. (e)	Length. (l)	Breadth. miles. (b_m) mean.	(b) max.	Mean diameter. ($2r$)	Reduced circumference. (c)	Area of lake. (a)	Mean breadth per cent. of length (relative breadth). $\frac{100\ b_m}{l}$ %	Islands. (i) A. of i. (: number of i.). i_m (: i_n)
		feet.	miles.	mean.	max.	miles.	miles.	square miles.		square miles.
Jannina	1:75,000	1640	5·0	1·46	1·9	3·0	23	7·3	29·3	0·8 (: 1)
Kastoria	1:100,000	2100	4·2	2·20	3·4	3·6	29	10·5	46·0	—
Dojran	,,	485	5·0	3·29	4·6	4·6	24	16·5	65·4	—
Ajvasil	,,	160	7·0	2·79	3·7	5·0	30	19·5	40·0	—
Malo†	,,	2990	10·9	1·84	3·8	5·1	45	20·0	16·9	0·36 (: 2)
Beshik	,,	160	14·7	1·80	2·9	5·8	55	26·5	12·2	0·8 (: 1)
Ostrovo	,,	1730	10·6	2·68	4·9	6·0	55	28·4	25·4	0·002 (: 1)
Ohrid ...	,,	2300	18·3	5·68	7·8	11·6	83	104·0	31·0	—
Prespa	,,	2980	18·3	6·06	11·0	11·9	104	111·0	33·1	0·4 (: 2)
Scutari	1:75,000	20	27·3	5·03	10·2	13·3	162	137·6	18·4	0·6 (: 34)

B.—Basin of Lake.*

Lake.	Number of soundings.	Depth. feet. (D) max.	(D_m) mean.	Volume. (a. D_m=V). milliards of cubic feet.	Height (H) of Segment (S) feet. (H_l) for length.	(H_b) for max. breadth.	(H) for mean diameter.	Basin-form. $\left(\frac{3D_m - D}{D}\right)$	Relative depth. $\frac{S}{V}$ or $\frac{H_m}{2D_m}$	Mean slope. ° ′
Jannina	82	34·5	14·1	2·83	4·1	0·6	1·5	+0·23	18·60	0 24
Kastoria	106	33·8	12·1	3·53	3·7	1·9	2·2	+0·08	11·20	0 18
Dojran	111	32·5	22·3	10·24	4·2	3·5	3·5	+1·06	12·60	0 16
Ajvasil	104	27·6	20·7	11·30	8·0	2·4	4·0	+1·24	10·30	0 14
Malo ...	80	25·3	11·5	6·36	11·0‡	2·4	4·3	+0·36	5·10	0 15
Beshik	140	73·2	45·3	33·55	36·0	1·4	5·7	+0·86	15·90	0 42
Ostrovo	198	202·0	87·0	68·87	18·4	4·0	6·0	+0·29	29·10	1 17
Ohrid	204	938·0	479·0	1391·60	56·0	10·0	22·2	+0·53	43·10	3 00
Prespa	250	178·0	60·7	187·44	52·0	20·0	23·6	+0·02	5·30	0 32
Scutari	240	144·0 (26)	15·7	60·00	100·0	17·4	29·5	−0·67	1·06	0 8

* Formula and construction of the new limnometric conceptions or determinations announced in this article, will be developed in H. Gravelius's 'Zeitschrift für Gewässerkunde,' Dresden.

† = small lake, wrongly called Ventrock-See.

‡ With 8·1 miles visible distance.

REVIEWS.

EUROPE.

Ireland.

'Ireland, Industrial and Agricultural.' Edited by William P. Coyne, Superintendent of Statistics and Intelligence Branch, Department of Agriculture and Technical Instruction for Ireland. Dublin. 1902.

The first edition of this encyclopædic work on the industrial resources and industrial occupations of Ireland was prepared for the Glasgow Exhibition of 1901, in which the sister island won exceptional renown by the general excellence of her exhibits. The present edition, the second, is a much-improved and greatly amplified version. Amongst the practically new sections there is one of great merit on the canals of Ireland, a factor which ought to be made to play an important part in the future development of the country. Although written in the first instance as a handbook to the Irish section of the Glasgow Exhibition, this book is very different, in its plan, its scope, and its treatment, from the majority of such works. It invites comparison with, as it was probably suggested by, those first-rate compilations, 'Norway' (1900) and 'Sveriges Land och Folk' (1900), both written for the last Paris Exhibition. All three books would be not incorrectly described by calling them special encyclopædias, the object being to give a fairly full account, under a diversity of headings, of the various phases of national activity, the constituent features of the country itself, and a fair summary of its economic condition and prospects. It should, however, be stated that the Irish book is less comprehensive in its scope than either of the other two with which we have compared it, in that it confines itself entirely to the agricultural and industrial factors, and only steps outside of those limits for the purpose of making clear the essential conditions which underlie those factors, and which have governed their growth and development. In fact, it may be said to be the first systematic attempt made since Sir Robert Kane wrote, in 1844, his 'Industrial Resources of Ireland,' to present anything approaching to a complete survey of the economic resources of the Emerald Isle. From the point of view of physical geography, the most important contribution to the volume is a paper on "The Topography and Geology of Ireland," by Mr. Grenville A. J. Cole, which, although couched in popular language, and covering a good deal of ground in a comparatively few pages, is distinguished by breadth of knowledge, a wide imaginative grasp of the subject, and remarkable lucidity of expression. One is able to gather from it a vivid conception of the way in which this outlying buttress of the primeval European continent came to be built up and assume the aspect it wears to-day. Ireland's woes began long antecedent to the advent, or even the presence, of man upon her shores. Although she was once richly endowed with coal-measures, the life-blood, so to speak, of modern industrialism, she was not allowed to retain them. The thrust and pressure of later geologic upheavals, aided by the influences of an unfriendly climate, swept them all away. Yet even this did not happen without some compensating advantages being vouchsafed to the island. She has her lovely lakes and crumpled hills of Killarney and the south; she has her rugged western and north-western coasts; she has her useful limestones, marbles, and granites, which, however, are not employed to anything like the extent their inherent beauty would suggest they ought to be; and she has her great inland plain, with its evergreen pastures, and its endless miles of bog—this last, too, not without its value should any of the numerous schemes for converting turf to industrial uses ever prove commercially successful.

Two of the most interesting features in the geography of Ireland are the fjords

of her western coasts and the peculiar formation and direction of her rivers. The former, as this book points out, exhibit several close resemblances and parallels with the west coast of Norway. A glance at the map will show that most of the rivers of Ireland flow to the south; though the upper courses of several of the largest, *e.g.* the Bandon, Lee, Blackwater, and Suir, run in a west-east direction. The primeval direction was to the south; but after the great foldings which took place subsequent to the Carboniferous era, the eastward-flowing affluents gained the ascendency, owing to the main rivers being unable to cut their way through the obstacles presented by the new anticlinal folds. This, however, was fully explained by Prof. Jukes as long ago as 1862. We have left ourselves barely space to allude in the briefest fashion to the astonishing progress which Ireland has made in agriculture, more particularly in dairying, during the last ten or a dozen years, an advance which is principally owing to the Hon. Horace Plunkett and his persuasive power in getting the Irish farmers to co-operate for their mutual advantage. The great things which have been already done for the awakening of Ireland agriculturally surely justify hopes of her ultimate regeneration, hopes which are now entertained by several thoughtful and far-seeing men, amongst them, we gladly note, such shrewd statesmen as Sir Wilfrid Laurier and President Rooseveldt.

French Hydrology.

'1er Congrès du Sud-Ouest Navigable tenu à Bordeaux les 12, 13 et 14 Juin 1902.' Compte Rendu des Travaux. Paris and Bordeaux: L. Mulo, etc. 1902.

For some time past a movement has been on foot in the south-west of France for the improvement of the system of inland navigation in that part of the country, where it has been exposed to a steady and progressive deterioration for many years. This movement—the need for which is shown by the almost entire neglect of south-western France in the Government schemes for the improvement of French waterways—led in September, 1900, to the foundation of an association at Bordeaux for the purpose of impressing on public opinion the need of decisive action in the matter, and this association, known first as the "Société de la Garonne Navigable," but subsequently widened in scope by the substitution for "Garonne" of "Sud-Ouest," has since been strengthened by the formation of branch associations with similar objects in many of the towns of the region affected. The first general congress of the several branches was held at Bordeaux last summer, and the proceedings of the meeting have been printed in the volume now before us, which extends to close on 500 pages.

These proceedings include several valuable papers dealing not only with the more technical question of the improvement of waterways, but with the wider subject of the general regularization of water-supply, and from this point of view the volume is an important contribution to physical geography. The evil to be combated is shown to arise from the increasingly irregular flow of water in the streams which descend from the Pyrenees, and are at times raging torrents, while at others they carry hardly any water at all. The activity of the erosion which takes place when the streams are full is such that, as shown by M. Bouquet de la Grye in a communication on the present state of the Gironde estuary, the river channels are blocked with sand and gravel, which, at ordinary level, the streams are quite unable to clear away. The readers of papers were unanimous in showing that the fault lies with the destruction of the natural vegetable covering of the soil in the mountains from which the rivers spring, owing to the increase in cultivation and pastoral industries, and that the only effectual remedy is the reforestation of the mountains, or the

clothing of their bare slopes with turf. In an elaborate paper on this branch of the subject, M. Fabre gave a forcible demonstration of the *rôle* of the forest in the regularization of the water-supply, quoting many instances from other countries of the evils which have resulted from a neglect to recognize this, and showing how the natural conditions in the south-west of France tend to exaggerate the struggle *pour et contre l'eau*. Unlike some recent writers, he still holds to the belief that an appreciable though small influence on the extent of precipitation is exercised by forests, though the importance of their action does not consist solely or chiefly in this. Other important papers deal with the conditions of precipitation on the northern versant of the Pyrenees, with the industries dependent on the waterways, and with various engineering projects for the extension and improvement of navigation, some of the last, as, *e.g.*, one for the impounding of the detritus by a huge trench carried across the bed of the river, being decidedly original. There are, in fact, few branches of the subject which are not fully discussed in the volume.

ASIA.

Russian Central Asia.

'Mountainous Bukhara.' Results of Three Summer Journeys in Central Asia in 1896, 1897, and 1899. V. I. Lipski. Part 2. Hissar, Peter the Great Range, Alai, 1897. St. Petersburg, 1902. (In Russian.)

This is the second part of the work reviewed on p. 64, and deals with the traveller's explorations in 1897. Having been hindered from exploring the Tupalang valley in 1896 by the rains and floods, M. Lipski returned to that part of the Hissar range in 1897, and travelled up the valleys of the Khovak and Chash, the former of which is the more important and must be considered the source of the Tupalang. At its head is the pass marked on maps Siya-kukh, but only known to the natives as the Panj-ab, the name applied to the upper course of the river. M. Lipski reached a height of 11,000 feet, but did not visit the pass itself, which seems to be little frequented, for no track was noticeable. The Chash pass is about 12,600 feet above sea-level. The upper basin of the Tupalang consists of rocky valleys often difficult of access, leading to snow-covered passes. The vegetation is poor, especially where it is exposed to the full glare of the sun, and the inhabitants are consequently far from prosperous. The Karatag valley was also visited, whence the Russian territory may be reached by the Mura pass, 13,302 feet high. It had been reported that the pass had been closed by avalanches, but M. Lipski found it by no means impracticable, though difficult. Proceeding to Darwaz, Lipski made a short excursion while his horses rested at Tabi-dara, crossing the Rabat pass, 11,165 feet, over which the natives of Darwaz bring corn from Karategin, and descending the Khumbou river to Kala-Khum, the capital of Darwaz. He then returned to Tabi-dara, and continued his journey to Peter the Great range, which he was particularly anxious to explore. Oshanin, who discovered the range in 1878, estimated its height at 20,000 to 25,000 feet. M. Lipski, however, believes that it is not more than 17,000 to 18,000 feet. The Hardan-i-Kaftar pass, by which he crossed the range from the valley of the Khingou, is 12,700 feet high, and the summits of the range appear to rise about 4000 feet above it. All the western part of these mountains consist of a sharply cut ridge with no summits rising much above the general level. Every valley and ravine contains a glacier. Chief among these are the Borolmaz, which descends from two peaks, the Borolmaz ("the wolf even has not been there") and Murtag ("icy" or "snowy mountain"), the Peter the Great glacier, and the Oshanin, all named by M. Lipski. They terminate at heights of 11,000 to 13,000

feet, and below them lie extensive moraines, which show that they were much longer formerly. Of the three streams which issue from the Borolmaz glacier, one, the Kara-Shura, breaks southwards through the range and falls into the Khingou under the name of Shakli-su. A fine view of the range is obtained from the Tunguyuk-kul, a lake in the Surkab valley, 3½ to 4 miles long by 2½ to 3 wide, and lying at an altitude of 10,700 feet. M. Lipski returned to Samarkand across the Alai and by Margelan.

Tin Mining in the Malay Peninsula.

Octave J. A. Collet. 'L'Étain, Étude Minière et Politique sur les États Fédérés Malais.' Brussels: Falk fils. [1902.]

The first title of this work would lead us to expect in it a study of tin and tin-mining in general. In reality the book, as the secondary title implies, is a monograph on the Federated Malay States and the mining industry practised in them—from which, it is true, no less than three-fifths of the total tin-supply of the world is derived. The first part consists of a clear summary of the geography and political history of the peninsula, a striking description being given of the recent development of the states under British protection. This development is, as is well known, almost entirely due to the progress made with the tin-mining industry of late years, and it is to an account of this that the larger part of the book is devoted. The broad features of the geology of the Malay peninsula, and the mode of occurrence of the tin deposits, are well described in the third chapter, while the manner of working the deposits, and the general economic position of the industry, are dealt with in the last three. At present the attention of the miners has been devoted almost entirely to the alluvial deposits in the valleys, but a more careful examination of the country is bound to reveal veins of tin ore *in situ*. Out of a total production of 75,000 odd tons in 1900, the Malay States were accountable for 42,000, and the whole Malay region (including Banka, Billiton, etc.) for 61,000. The production in England, Australia, and Bolivia reached only 4000, 3000, and a little under 7000 tons respectively, both the two former sources having shown a decided falling-off of late. The predominant position occupied by Malaysia is thus clearly shown. M. Collet considers that this region was the source of the tin-supply of the ancients, but does not solve the difficulty presented by the question of the transport of the ore in the small and frail vessels of those early times.

The Andamans and Nicobars.

'In the Andamans and Nicobars.' By C. Boden Kloss. John Murray.

This contribution to the accounts, more or less exhaustive, which have been published by travellers and by officials connected with the administration of the penal settlements at the Andamans and Nicobars since the annexation of those islands to the British Crown in 1858 and 1869 respectively, is a pleasantly written record of a successful cruise of some three months' duration (January to March, 1901) in these islands, "the main purpose of which was to obtain good representative collections (now in the National Museum, Washington, U.S.A.) of natural history and ethnological objects from the places visited. Special attention was given to the trapping of small mammals, which, comprising the least-known section of the island fauna, were the most interesting subject for investigation. Sixteen new varieties were obtained in the Andamans and Nicobars together, thus raising the known mammalian fauna of these islands from twenty-four to forty individuals, while the collections also included ten hitherto undescribed species of birds." Thus

is prefaced a work whose interest will be as great to the general as to the scientific reader, for Mr. Kloss brings to his task keen powers of observation and a freshness of style, while a certain dry humour is not absent from his pages. He has also evidently been at pains to inform himself of the works of many previous writers on the special objects of his cruise, as well as on the general geographical and ethnographical characteristics of the islands and their inhabitants; and by sundry well-chosen extracts from these records, places before his readers in a condensed form much information of great interest hitherto inaccessible to the general public. An excellent series of photographs taken by himself illustrates the text, while a chapter on the fauna of both groups of islands, together with useful appendices, a map, and a good index further enhance the value of the work.

Concerning the geology of the Andamans, Mr. Kloss writes, "It is curious that in the valley of the Irrawadi hot springs and other evidences of volcanic action occur in the same relative position to the Arakan hills as the two islands of Narkondam and Barren island occupy in respect to the Andamans. There seems little doubt that these two islands—now respectively extinct and quiescent—belong to the great line of volcanic disturbance that appears in Lower Burma and extends right through Sumatra and Java and the further islands of the Malay archipelago. Thus it would seem that the Andamans proper, possessed of no volcanoes themselves, lie just outside the line of activity, and, with the Nicobars, occupy the same position with regard to the volcanic track as do the chain of islands west of Sumatra." Had Mr. Kloss visited Narkondam as he did Barren island, he would have discovered that, though of volcanic origin, the island differs from its neighbour in possessing no volcano. It was, however, not until comparatively recent years that the long-prevalent belief in the existence of a volcano there was found to be incorrect.

Mr. Kloss points out that the great peculiarity of the Andaman flora is that no coconuts naturally propagated are found throughout the group, although the adjacent Cocos islands to the north and the Nicobar islands to the south are covered with them. In regard to this, it may be remarked that a considerable extent of the Andaman coast is protected by reefs, or consists of mangrove swamps or dense jungle where coconuts could not establish themselves; and it is doubtless mainly due to the special measures taken by the local authorities to protect the seedlings when planting them that, in the localities suited to their propagation, such as open sandy beaches, they have nowadays escaped destruction at the hands of the aborigines, as well as from pigs, rats, etc.

Of the aborigines Mr. Kloss truly remarks that "it would be impossible to find a race of purer descent, for ever since they peopled the islands in the Stone Age they have remained secluded from the outer world, and to this isolation is due the uniformity so marked in their physical and mental characteristics. In stature they are far below the average height; but, although they have been called dwarfs and pygmies, these words must not be understood to imply anything in the nature of a monstrosity. Their reputation for hideousness, like their poisoned arrows and cannibalism, has long been a fallacy, which, although widely popular, should now be exploded."

On the subject of the long-continued decadence of the native race, he writes, "The population of the islands has been computed from time to time—from the 6000 at the period of the founding of the settlement—in variously diminishing numbers down to the present day, when it is placed at about 1900. The case affords a striking example of the effect of contact between civilized and savage man, for only those tribes of the Andamanese that are still hostile, or who have little or no intercourse with the Government settlement, have preserved any

respectable number of individuals in their ranks. Of these, the Jarawas, although not distantly located from the settlement, receive all advances with inveterate implacability; while the Öngés of Little Andaman, who were until 1884 almost totally unvisited, are further off and enjoy an insular position."

As, however, only two of the twelve weeks passed in these groups were spent at the Andamans, Mr. Kloss has naturally more to say regarding the Nicobars and their inhabitants, based on the notes and observations made during the ten weeks that the yacht was cruising in the archipelago. His mode of spelling the names of certain of the islands is unfamiliar to those best acquainted with them, and is apparently copied from the excellent charts prepared in 1886–87 by Lieut.-Colonel G. Strahan, R.E., of the Survey of India.

Mr. Kloss has much of interest to relate of these islands and their scattered communities; he was fortunate in arriving during the celebration of certain memorial feasts, and also in meeting several members of the friendly branch of the remote inland tribe of Great Nicobar, known to the coast people as "Shom Peń." ("Shom," in the dialect of the coast tribes, signifies "natives," and "Peń" the tribal designation.)

It has long been held by the Government authorities—and Mr. Kloss is of the same opinion—that the members of the inland tribe, which is nowadays confined to the only large island of the archipelago, are descendants of the ancient aborigines of the group, who, "although everywhere else either exterminated or absorbed by settlers from outside, have in Great Nicobar found a refuge in the forest depths, and by long-standing hostility to the intruders, arising from some unknown cause, have preserved to a great extent their natural traits and existence, although somewhat degenerated, both on account of the less favourable circumstances in which they live, and of the interbreeding that the smallness of their numbers compels." As regards the coast inhabitants, Mr. Kloss adduces good grounds for the diversities of type noticeable among the natives of the various islands of the group.

In view of the fact that Mr. Kloss succeeded in amassing much detailed information on a great variety of subjects during his brief tour, it is somewhat surprising to find that he makes no reference to the remarkable robber-crab (*Birgus latro*), or to pythons and snakes, all of which are fairly numerous at most of the Nicobar islands. The late Dr. V. Ball, F.R.S., author of the valuable work entitled 'Jungle Life in India,' regarded the Nicobar robber-crab as an object of such interest that he decorated the cover of his book with a sketch of this peculiar crustacean.

But, in spite of certain errors and omissions which could hardly be avoided in observations made in the course of so brief a visit by one unacquainted with any of the dialects of the races concerning which he was writing, Mr. Kloss is to be heartily congratulated on his valuable contribution to our present knowledge of these islands and their inhabitants. It is to be hoped that this is not the only work we shall have from the pen of so competent an observer and explorer.

E. H. M.

AFRICA.

The Congo State.

'Civilization in Congoland: A Story of International Wrong-doing.' By H. R. Fox Bourne. London: P. S. King & Son. 1903.

Without discussing the merits of the controversy now raging with regard to the administration of the Congo State—a theme which hardly comes within the province of a Geographical Journal—we may safely say that this is a book which

must be read by all who wish to form an independent judgment on the questions under dispute, by candidly weighing the arguments brought forward on both sides. As the title of the book sufficiently indicates, Mr. Fox Bourne brings a serious indictment against the authorities of the State, holding that the whole methods of rule have been radically at fault, and have therefore had their natural outcome in the monstrous abuses which he considers fully substantiated by the evidence. In developing his thesis he goes back to the events which led up to the founding of the State, and traces its whole history downwards to the present day, so that, apart from the main theme of the volume, there is much that is likely to prove useful in the body of facts thus brought together, many of which are little known to the general public. There are chapters on early explorations and enterprises, on commercial developments, and on the relations subsisting between the Congo State and its neighbours; while an excellent map by Bartholomew is given at the end.

Present Relations in West Africa.

'Affairs of West Africa.' By Edmund D. Morel. Illustrations and Maps. Heinemann. 1902.

Under an elastic and even somewhat vague title, Mr. E. D. Morel, of the Liverpool Chamber of Commerce, has brought together a large amount of generally trustworthy information on the present political, racial, and economic relations in West Africa. With the rapid growth of the various European hinterlands the expression "West Africa" has acquired a very wide meaning, and is here understood to comprise all the British, French, German, and Belgian possessions ranging from the Atlantic seaboard inland to Lakes Chad and Tanganyika. Little is said about the German territory, but the problems associated with the social, religious, historical, and administrative conditions of all the other colonies are dealt with in a lucid and vigorous manner by a writer whose competency to discuss these complex matters is shown by previous contributions to the *Pall Mall Gazette*, the *Contemporary Review*, and several other periodicals under the familiar initials E.D.M. Mr. Morel speaks, in fact, *en pleine connaissance de cause*, as is made abundantly evident from the sections devoted to the British administration of the two Nigerias, to the French in West Sudan, to the monopolies ("concessions") in the Congo State, to the Fulani (Fulahs) and Hausas, *i.e.* the two politically or socially dominant native races north of the equator, to the rival Mohammedan and Christian propagandas, and generally to the natural products and trade prospects of the whole region. To these multifarious contents must be added a special chapter on the climate and sanitary conditions, contributed by Major Ronald Ross, the one universally recognized authority on these vitally important subjects.

It should be further stated that Mr. Morel is no mere compiler, but a close student and critical observer of passing events, whose trenchant remarks, scathing indictments where called for, and general inferences should arrest public attention, and be taken to heart by those more nearly concerned. While the trade of the French possessions is steadily increasing with a diminishing expenditure, the contrary is the case in their "moribund neighbour, Sierra Leone," where in recent years "the expenditure has increased by over 100 per cent. in the face of a decline in the producing power of the country."

A considerable space is devoted to the present state of affairs in the Congo State, regarding which our author shows himself to be particularly well informed. But the subject is scarcely suitable for discussion in this place, and it must suffice to say that the picture presented by him is deplorable. The chapters on Christian and Moslem rivalries in West and Central Sudan might also be studied with

advantage by philanthropists and enthusiasts. It is here plainly shown why Islam steadily advances, while Christianity fails to make any perceptible headway amongst the teeming Sudanese populations.

In future editions of this indispensable volume a proper set of maps should be supplied, and the index greatly enlarged. The proof-sheets will also need careful revision, such eye-sores as *ad literatim*, *irrespective* for *respective*, *was* for *were*, *whom* for *who*, *conquisitadores*, etc., being of far too frequent occurrence. It is also, I think, somewhat misleading to speak of De Béthencourt as having "conquered" the Canaries, that bold Norman rover having merely established himself at Lanzerote, and secured a footing in Fuerteventura, and perhaps one or two other points. But, generally speaking, the historical references are singularly correct, the very best authorities, such as Barth, Faidherbe, Binger, Verneau, Ellis, Clozel, Foureau, Goldie, Macgregor, Nachtigal, having in most cases been consulted.

A. H. Keane.

AMERICA.

The Colorado River.

'The Romance of the Colorado River.' By Frederick S. Dellenbaugh. New York and London: Putnam. 1902.

The thrilling story of discovery in the Farther West of North America has yet to be told in a form suitable both to the general reader and the less advanced student of historical geography. A chapter in that story—and that perhaps the most fascinating of the whole—is, however, now supplied by Mr. Dellenbaugh, one of the members of Powell's Second Colorado Expedition of 1871–72, who gives in the work quoted above a comprehensive and most interesting account of the whole course of exploration in the Colorado region from 1540 onwards, while at the same time, as is but fitting, giving special prominence to the great expeditions by which the secrets of the Colorado cañons were for the first time revealed. The history is grouped by the author into four epochs, the first being that of the discovery by the Spanish conquistadores; the second the period of the "entradas" of the padres; the third that of the wanderings of the trappers; and the fourth the period of modern scientific exploration. The great names associated with Colorado discovery have of course been adequately dealt with in such works as Winship's 'Coronado Expedition,' Prof. Elliot Coues's edition of the Padre Garces' intrepid journey, and the like. But there are a host of minor names, especially in relation to the third period, which are almost unknown to the general public, but which all bore a part in the opening up of the region, and fittingly find a place in Mr. Dellenbaugh's narrative. Where necessary, the author enters into discussions on disputed points. Thus he holds that the point of the grand cañon reached by Cardenas—Coronado's lieutenant—was considerably lower than has been usually supposed, while he treats the whole story of the descent of the cañon by White in 1867, recorded by Dr. Parry,* as a myth. Among the modern expeditions and surveys—in addition to Powell's—which are dealt with in the volume, those of Derby (1850–51), Ives (1857), Wheeler (1871), Brown and Stanton (1889–90), may be specially mentioned, and among the trappers of the earlier period, Pattie and Jedediah Smith. The personal narrative of Powell's second expedition supplied by Mr. Dellenbaugh is in many ways more complete than any yet published, and in writing it the author has had the advantage of access to Prof. A. H. Thompson's

* Besides the account quoted by Mr. Dellenbaugh, a version of the supposed journey was given by Major Calhoun, a companion of Dr. Parry, in the first volume of Bates's 'Illustrated Travels.'

river-diary as a check to his own. It should be mentioned that chapter iii. gives an excellent account of the general character of the region and its inhabitants, while the work is profusely illustrated by photographs, and some striking paintings by the author are also reproduced.

The Martinique Eruptions.

'Mont Pelée and the Tragedy of Martinique.' By Angelo Heilprin. Philadelphia: J. B. Lippincott Company. 1903.

Already a considerable mass of literature has accumulated on the subject of the recent eruptions in the West Indies, and additions are being made to it daily. Prof. Heilprin's book is a very welcome contribution, as it contains a great deal of first-hand information which the author collected during two visits to Martinique, made expressly for the purpose of studying its celebrated volcano. He gives a full and clear summary of the events that preceded and led up to the great catastrophe of May 8, 1902, and though most of the facts have already been published, his *résumé* is interesting. The really novel part of the book begins with his first visit to Martinique shortly after the second eruption, which on May 20 completed the destruction of St. Pierre. Prof. Heilprin was the first to reach the actual summit of Montagne Pelée after the disaster, and, though he was baffled by the clouds which hang around the mountain-top, this only led him to return next day, when, for a few minutes, standing on the lip of the crater, he was able to get a glimpse of the abyss that lay beneath his feet.

In the end of August he returned to renew his investigations, and the chapters in which he describes his experiences during that visit make thrilling reading. From the eastern base of the mountain, which at that time was green and flourishing, he started again for the summit. The volcano was in a condition of great uproar. After his party had ascended to a considerable height, they were enveloped in dense cloud. In front of them the crater roared, and through the air blocks of rock were falling with a whistling noise, landing on the slopes with a dull hollow thud. With indomitable courage he pushed on, and a temporary rift in the clouds enabled him to see a vast column of ash-laden steam rising from the crater to a height of several miles. Finally, he had to beat a retreat, with the secret of Pelée's crater still unsolved.

That night an eruption broke out, and the deadly black cloud wiped out the villages of Morne Rouge and Ajoupa Bouillon, killing about 2000 of their inhabitants. Prof. Heilprin was in a mansion house on an estate close at hand, but escaped without injury, as apparently the cloud passed overhead. The description of his experiences during that day and night are of the greatest interest and scientific value.

A very brief chapter is given to the eruptions of the Soufrière in St. Vincent and one to the volcanic relations of the Caribbean chain. In another the author discusses fully the evidence that the Plinian eruption of Vesuvius, which destroyed the towns of Herculaneum and Pompeii, was of the same type as those of Montagne Pelée, and arrives at the conclusion that they were similar in their essential characters. The book contains comparatively little geological or mineralogical detail, and is evidently meant for the general reader. Its language is vigorous and picturesque, and it is well illustrated by reproductions from photographs, many of which were taken by the author or his companions. Its descriptions of the scenery of Martinique and the appearance of the devastated country are very vivid.

J. S. F.

Mexico.

'Quer durch Mexico vom Atlantischen zum Stillen Ocean.' Von Dr. Wilhelm Schiess. Berlin: D. Reimer. 1902.

This work describes a journey through Mexico, made by Dr. Schiess in company with his brother, in the winter of 1899–1900. The author does not claim to be a scientific geographer, but, as some portions of his route led through parts of Mexico not generally visited by tourists, and as, moreover, he shows himself a capable observer, with a considerable power of grasping the characteristic features in the landscape, and of describing them so as to bring them clearly before the mind of his readers, the book is to be welcomed as supplying a good bird's-eye view of the country as well as of the mode of life of its people. Dr. Schiess both entered and left the country from the north, by way of New Orleans, proceeding by rail to the industrial centre of Torreon (recently developed at the expense of the neighbouring Lerdo, owing to its position as a meeting-point of five railways), and thence to Durango, whence the Sierra Madre was crossed to the Pacific port of Mazatlan. Steamer was taken thence to San Blas, which served as a starting-point for a journey from west to east through the more southern provinces. Here, among other excursions, an ascent was made of Popocatepetl, of the crater-wall of which an excellent photo is given. Dr. Schiess draws a vivid picture of the sun-scorched interior plateau on which Torreon is placed, though he remarks on the industrial development which even here has been fostered by the enlightened rule of President Diaz. But the part of the journey which presents the greatest interest is that by the still little-frequented mule-track across the Sierra Madre, during which the travellers often camped in the open with a night temperature as low as 18½° Fahr. Towards the east of the range such forests as ever existed have been almost entirely destroyed by the inveterate proclivities of the Spanish race in this direction, but in the more central and western parts the track leads through continuous forests, almost entirely of pines at the higher levels, but with oaks and other trees as the ground falls to the west. Few inhabitants were seen among the mountains, except at occasional ranches which were passed. Further south, on the way from San Blas to Mexico city, the beaten track was again left at various points, and the description of this section of the country is of considerable interest. The book is throughout well illustrated by photographs.

'Unknown Mexico.' By Carl Lumholtz. 2 vols. (illustrated). Macmillan. 1903.

Even before the publication of his graphic account of the Queensland aborigines ('Among Cannibals,' 1889), Mr. Lumholtz had made arrangements to prosecute his studies of primitive races in the still imperfectly explored regions of the Mexican plateau. The special attractions were the current reports of the cavemen surviving in the Western Sierra Madre, whose possible relations with the recently extinct cliff-dwellers of the Colorado cañons presented a fascinating subject to archæological students. Aided by liberal donations from Mr. Andrew Carnegie and other private sources, and from the American Museum of Natural History and Geographical Society of New York, Mr. Lumholtz was enabled to lead four separate expeditions to the western parts of the republic—one quite alone, the others in association with Mr. A. M. Stephen, Mr. C. V. Hartman, Dr. A. Hrdlicka, and several other distinguished naturalists. These expeditions were carried out at intervals between the years 1890 and 1898, and, as stated in the sub-title to the present work, constitute "a record of five years' exploration among the tribes of the Western Sierra Madre, in the Tierra Caliente [hot zone] of Tepic and Jalisco and among the Tarascos of Michoacan."

Most of the results have already appeared in the *Bulletin* of the American Geographical Society, in the *Proceedings* of the American Academy of Arts and Sciences, in this *Journal*, and in various other scientific periodicals. But the author was well advised to resume the whole subject in the consecutive narrative, enriched by numerous illustrations and maps, which, with a linguistic appendix and other useful added matter, forms the contents of these two handsomely equipped volumes.

As stated in the paper on his "Mexican Explorations" in the *Journal* for February, 1903, Mr. Lumholtz found that the Tarahumara cavemen were unconnected with the ancient cliff-dwellers of the South-Western United States, and a primary object of his researches was thus settled in a negative sense. But while this "connecting link" was snapped, others of wider significance were unexpectedly suggested, if not established. A great part of the second volume is devoted to the Huichol natives, who beyond all others are noted for the deep religious feeling which permeates the whole social system, and finds expression, so to say, in the symbolic spirit breathed into all their works, and animating all their surroundings. This is remarkable enough in the case of a people holding such a low cultural position as they do. But it is still more remarkable when we find their highly developed symbolism revealing many elements in common with the systems prevalent amongst the Pueblo Indians in the far north, and amongst the Aztecs of the Mexican valley. Such connecting links, long suspected by archæologists, are certainly strengthened by the investigations of Mr. Lumholtz, who further points out that some of the pottery unearthed by him in several districts "forms a transition from the culture of the pueblos of Arizona and New Mexico to that of the valley of Mexico, 1000 miles farther south" (vol. i. p. 94). Thus everything goes to confirm the growing opinion that the Aztec migrations were really from the north; while some even hazard the somewhat risky opinion that the seven caves of the shadowy Aztlan of the Nahua traditions may be the equally shadowy "seven cities of Cibola" which the early Spanish adventurers went in quest of and thought they had found amongst the *Casas Grandes* of the Tusayan pueblos. In any case, the range of these huge communal structures is much greater than is commonly supposed; and in the "Cave valley" of the state of Chihuahua Mr. Lumholtz explored the ruins of a great number—"not palaces, but simply dwellings, the whole village, which probably once housed 3000 to 4000 people, resembling in its general characteristics the pueblos in the south-west" [of the United States].

Here were recovered many beautiful jars and bowls, "far superior in quality and decoration to anything now made in Mexico" (i. p. 88). But even these were eclipsed by the earthenware objects brought to light in the Tepic district much farther south. Some of these, like those described by Mr. Holmes from Chiriqui (Costa Rica), had an exquisite polish resembling true glaze, and one superb vase, described and beautifully reproduced with all its wealth of colour (vol. ii. p. 296), will rank amongst the very finest specimens yet discovered in the New World. Well may the lucky finder exclaim that "not many specimens of such ware are to be seen in the museums of the world, and in some respects [the gold foil and rich greenish-blue sheen of the opalescent turkey plumage], none of them is comparable with the one here described" (p. 297).

The only fault to be found with these handsome volumes is their inconvenient weight, which is due to the unusually thick paper, needed perhaps for the effective reproduction of the numerous original illustrations.

A. H. KEANE.

POLAR.

The Italian Arctic Expedition, 1899–1900.

'La *Stella Polare* nel Mare Artico, 1899–1900.' Pp. 592. 'Osservazioni scientifiche eseguite durante la Spedizione polare di S.A.R. Luigi Amedeo di Savoia, Duca degli Abruzzi, 1899–1900.' Pp. 723. Milan: Hoepli. 1903.

'On the *Polar Star* in the Arctic Sea.' By H.R.H. Luigi Amedeo of Savoy, Duke of the Abruzzi. Translated by William Le Queux. Two vols. London: Hutchinson & Co. 1903.

In these two volumes recently published, a detailed account is given of the work of the Italian Arctic Expedition. The leader, the Duke of the Abruzzi, relates the incidents of the voyage to Prince Rudolf island, and the work of the party at their winter quarters at Teplitz bay. The voyage up the British channel was not accomplished without difficulty owing to the floating ice, and on the return voyage the vessel was imprisoned in the ice for fourteen days, and carried out to sea through De Bruyne sound. In Teplitz bay the *Stella Polare* was berthed amidst the land-ice, which, however, did not protect it from the pressure of the pack outside, and consequently the members of the expedition had to make a hasty retreat to the shore. Fortunately, it was found possible to repair the damage, and, with great labour and by the use of mines, to extricate the vessel in the following summer. In the autumn a sledge expedition was made round the island, which was found to be covered with an ice-cap, leaving only a few patches bare at Teplitz bay, Cape Säulen, and Cape Fligely. In 1874, when Payer travelled to Cape Fligely, the exposed ground seems to have been more extensive, and probably the ice-surface is now contracting again, for the loss from evaporation and melting is certainly greater than the gain from precipitation. Owing to the lowness of the island, there is little movement in the ice, and no calving of icebergs was witnessed.

The chief geographical discoveries of the expedition were reported in the *Journal*, vol. xviii. p. 282, where also a sketch was given of Captain Cagni's trying and exciting journey towards the pole, when he succeeded in reaching some 30 miles (86° 34′ N.) beyond Nansen's farthest; and allusion was made to the difficulty he experienced in regaining the island owing to the westerly drift of the ice and the leads that constantly opened and closed in the pack. How great were the obstacles he had to overcome may be learned from his own narrative. He was provided with kayaks, but they had been damaged on the journey, nor could they have been used amidst the shifting ice. Frequently Captain Cagni crossed a channel on a small piece of floe, taking with him a rope, by which his companions towed themselves across with the dogs and sledges on a larger block; and on one occasion a short voyage was made on an ice-block, the sails of the kayaks being hoisted to catch the wind. Dr. Cavalli, who commanded one of the parties which accompanied Captain Cagni part of the way, had also to contend with broken ice, but returned safely to Teplitz bay, whereas Lieut. Querini, though he started back earlier, when Prince Rudolf island was still in sight, was lost with his two companions.

The expedition was well provided with instruments of all kinds, and scientific work was carried on with regularity, the physical observations being under the supervision of Captain Cagni, while Dr. Cavalli took charge of the zoological, botanical, and mineralogical collections. Soundings were taken in Nightingale sound, where a maximum of 250 fathoms was obtained, and in the southern part of the British channel. At Teplitz bay hourly observations of the atmospheric pressure, temperature, and humidity were recorded, and in summer of the direction and velocity of the wind, all of which are given in tables in the scientific

report. The temperature in winter was not extreme for the latitude, the mean for the coldest month, February, being −21°·4 Fahr., while the lowest reading was −45°·2. The force of gravity was determined at Cape Flora and at Teplitz bay with the Sterneck pendulum apparatus. The result for Cape Flora was $g = 9{\cdot}83088$ m. (32·25413 feet), and for Teplitz bay $g = 9{\cdot}83240$ m. (32·25911 feet). Prof. Luigi Palazzo contributes a report on the magnetic observations, and Lieut. Alessio on the tidal measurements. The latter has also worked out the astronomical observations, and gives the following co-ordinates: Cape Flora, lat. 79° 56′ 47″ N. (Jackson, 79° 57′ 1″), long. 3ʰ 20ᵐ 38ˢ E.; Teplitz bay, lat. 81° 47′ 36″·2, long. 3ʰ 52ᵐ 16ˢ E.; Cape Fligely, lat. 81° 50′ 43″ N. Captain Cagni carried with him on his excursion northwards a mirror, instead of a mercurial horizon, on account of its smaller weight. He found it very difficult to level, and was not satisfied with the results. Lieut. Alessio believes that the observations taken from the natural horizon are reliable, and are not affected to any appreciable extent by variations in refraction. Nevertheless, it is to be regretted that a mercurial horizon was not used.

As already mentioned in the report in the *Journal* referred to above, animal life is not abundant on Prince Rudolf island. Eight species of birds were obtained, all of which have been observed further south, and eggs of the glaucous and ivory gulls, the dovekie, and the little auk were collected. Of the molluscs three are probably new species. The botanical collection was small, as might be expected in an island so far north and mostly covered with ice. One species only is new to science, a fungus which has been named by Prof. Mattirolo *Ascochyta Ducis Aprutii* after the leader of the expedition. The report also contains papers on the remains of reindeer found on Prince Rudolf island, measurements of nineteen specimens of polar cod and of a white whale, and of skulls of walruses and polar bears. The basalts and zeolites of the island are also fully described.

The general narrative abounds with incident, and the story as a whole is full of interest. The English translation is well done, and the handsome volumes are richly illustrated, and contain several maps, as do also the volumes on the scientific results.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

The Vegetation of the Earth.

'Die Vegetation der Erde.' Sammlung pflanzengeographischer Monographien herausgegeben von A. Engler und O. Drude. 6 vols. Leipzig: Engelmann. 1896–1902.

Geographical botany has, unfortunately, not been considered by most travellers in foreign—known or unknown—districts a subject worthy of careful study before leaving home. In spite of this, however, every large expedition does of course bring back a more or less bulky collection of dried or preserved plants, many of which, however, often only represent the more conspicuous flowering plants. The material thus brought back is named by experts, and lengthy lists of plants are drawn up by persons who may never have seen any of the plants they are examining in anything but a dried condition. The lists drawn up in this way are useful only for ascertaining the geographical distribution of the plant *species*. The geographical distribution of the plant *species* is, however, only one aspect of geographical botany. From a purely geographical point of view, it is, perhaps, the least important; from a purely botanical point of view, it is certainly the least interesting.

During the last few years botany has in all its branches been more and more influenced by the physiological aspect of questions and problems. In no branch has this gradual change been more noticeable than in geographical botany.

The plant *species* has been replaced in importance by the plant *form*. The plant form—in its internal and external structure—is an expression of the way in which the plant has adapted itself to certain external conditions. Given certain conditions prevailing equally over a large area, we find the plants—whatever the specific differences may be—assuming certain common external and internal structures. They are said to belong to the same plant form. An association of similar plant forms gives us a formation.

Roughly speaking, three chief formations may be distinguished—forest land, grass land, and desert land. Their presence in any region depends on the amount of water available for the plant, and may thus be directly due to the rainfall and atmospheric moisture. Forest land demands a large supply of water, desert land is satisfied with very little indeed. But we may, in the centre of a climatic forest formation, get a miniature desert, owing to some peculiarity in the nature of the soil. The latter may consist of a mass of porous rocky material, which causes all the water from rain and other sources to immediately soak away into the ground. The climatic forest is interrupted by a desert on account of certain conditions obtaining locally, which are strong enough to counteract the effect of the climate. Such a local desert would be called an edaphic formation.

The vegetation of any district is dependent in the first place, therefore, on climatic conditions, and in the second place on edaphic conditions.

The composition of the flora of any district—that is, the plant species and natural orders met with—depends almost entirely on the distribution of temperature. This is evident already when tracing the distribution of plant species, but becomes still more evident if we take genera or even natural orders. The present state of any flora composed of plant species is the result of historical development; that of the native vegetation, consisting of plant forms, is an expression of the climatic or edaphic conditions obtaining within recent times.

Forest land, grass land, and desert land are the three chief formations, but we get various intermediate types of vegetation, of which the savannas, intermediate between the forest and the grass land, are an example.

The geographical distribution of the plant species and the composition of the flora of any given district is a matter of study for the botanist, pure and simple. A knowledge of the distribution of plant-forms—that is, a knowledge of the composition and nature of the vegetation, as reflecting the influence of external conditions—is of the utmost importance, not only to the botanist, but also to the geographer. The internal and external structure of a plant, when taken into proper account, may indicate fairly well the present-day climatic and geological conditions of the district. But experience is necessary before the secrets thus held by the plants are disclosed. These secrets, furthermore, are nearly in all cases revealed only on the spot. Dried or preserved, many characteristic features of the plant-form are destroyed and disappear.

On the occasion of the meeting of the International Geographical Congress at Berlin in 1899, a most important paper on the history and development of geographical botany was published by Engler. Engler divides the study of plant-geography into three branches. Floristic geobotany determines the flora of a country, and maps out its districts, regions, and formations. Physiological geobotany explains the occurrence and nature of the plant-forms, which make up the vegetation, by studying the prevailing climatic and edaphic conditions. Developmental geobotany tries to explain the development and evolution of the plant world in terms of the history, geological and otherwise, of the district. He goes on to say that no one of these branches of plant-geography will be furthered materially by any worker who is not a botanist. This is certainly very true, for, generally speaking,

only a botanist can advance botanical science. But a certain amount of knowledge on the subject of physiological geobotany, or ecology, as it is sometimes called, will certainly be of great use to travellers, and thus the science of geography may be furthered. I need hardly mention here that even a small amount of practical acquaintance with this branch of botany would make it far easier for the traveller to describe scenery, in which plants usually play such a prominent part. By being trained to use certain definite and well-defined technical terms to describe the vegetation of any district, geographers would on their travels be able to give a far better idea of the regions they have visited than they are at present.

The object of these few general remarks is to call attention to a series of geobotanical monographs, which are now in course of publication under the joint editorship of Prof. A. Engler and Prof. Oscar Drude. It is called 'Die Vegetation der Erde.'

In their preface, the editors have stated what the object of this publication is. It is, in the first place, intended to collect all that is known about certain floristic districts, and publish the results in the form of a number of separate monographs. Each monograph will serve a twofold purpose. The material which has so far accumulated will be more readily available for consultation, and travellers will more readily than heretofore be able to ascertain what is known about any district and what still requires further elucidation. These monographs are, therefore, intended as guides both for the geographer and the botanist.

The whole work on the vegetation of the Earth will be published in three parts. The first part, which is to appear last, will deal with the general principles of geobotany, climatology, in its influence on plant distribution, the development of floras, and investigation of their phylogeny, based on geology and biology.

The second part, which also will be published later, will be devoted to the plant formations, more particularly those of Europe and the neighbouring countries. The various formations will be treated of in separate monographs.

The third part consists of a series of monographs, now in course of publication, descriptive of naturally well-defined floral districts. It is proposed to complete this part first, as far as Europe is concerned, before proceeding to parts one and two. In the case of extra-European districts, it may, however, be impossible to keep them quite separate. So far, six volumes have appeared, dealing respectively with the distribution and conditions of plant-life in the Iberian peninsula, the Carpathians, the Caucasus, Illyria, North and Central Germany. Each volume contains a full account of the plant species, plant forms, and plant formations met with in the particular district. The books and papers containing references to the latter are also listed. Illustrations and maps are made use of, but rather sparingly.

O. V. Darbishire.

THE MONTHLY RECORD.

THE SOCIETY.

The Antarctic Expedition.—Since our last number was published, some additional details respecting the Antarctic Expedition have come to hand, both through telegrams to the public press and through a despatch from Captain Colbeck, supplementing the original report of Captain Scott. From this it appears that the possibility still remains that the *Discovery*

may return this season, the final decision depending on the date of the breaking up of the ice. This would seem to imply that the ship was still fast in the ice when the *Morning* sailed homewards, but in this case it could hardly be expected to be released before the return of winter. Again, it is stated that, the present position being unsuited for more extended operations, new quarters would be sought and work continued; which does not fit in with the idea that freedom of movement was not open at the time. In any case, the supplies taken over from the *Morning*, together with such part of the original stores as had not been condemned, are said to be quite sufficient for another twelvemonth; but this does not, of course, obviate the necessity for the return south of the *Morning* next season, in case the *Discovery* does not make her way out before the final setting in of winter. As regards the work accomplished by the sledge-parties, it is now known that Captain Scott and his companions were out for ninety-four days, instead of, as was stated in the first telegram, going south 94 miles only. This correction, together with that already made in the *Journal* with regard to the highest latitude reached (82° 17′), removes the chief difficulty in the way of following the course of the expedition. Another sledge-expedition, not alluded to at first, was that of a party under Lieut. Armitage, which is now stated to have gone west for fifty-two days, reaching an altitude of 9000 feet, and at one point making a perilous descent by an ice-slide of 3000 feet. On the return, Lieut. Armitage fell into a crevasse, remaining suspended 30 feet below the surface, and was only saved by being roped to the rest of the party. This journey should be of special interest, as it must apparently have led at right angles to the coast, into the very heart of Victoria Land. The symptoms of scurvy, which made their appearance during the course of these expeditions, disappeared, Captain Colbeck says, after the return to the ship. Lieut. Shackleton was advised by the doctor to return, but all who stayed with the *Discovery* were in good health and spirits, and cheerfully volunteered to remain another season in case of need. Lieut. Mulock, who went out in the *Morning*, volunteered for service in the *Discovery* in the place of Lieut. Shackleton.

EUROPE.

Sand-hill Vegetation on the Lancashire Coast.—A large part of the Lancashire coast is, as is well known, fringed by drifted sand-hills, which attain an extension hardly surpassed on any of the British coasts. In spite of the sandy nature of the soil, the district has a fairly rich flora, and its waste places seem to offer unusual opportunities for the establishment of adventitious species. Four such, which seem to be gaining ground with more or less rapidity, are described by Mr. C. Bailey, from the neighbourhood of St. Anne's-on-the-Sea, near Blackpool, in the *Memoirs* of the Manchester Literary and Philosophical Society for December 15, 1902. The first is one of the North American evening primroses (*Œnothera biennis*, Linn.), which has been established on parts of this coast for seventy or eighty years, and is one of the earliest plants to grow upon newly disturbed ground.

Although a prey to constant plucking, owing to its conspicuous flowers, it continues to spread more and more. Another colonist is the *Sisymbrium pannonicum* (Jacq.), a crucifer from continental Europe and Western Asia, which also occurs about Preston. Mr. Bailey's observations show that in 1902 it occupied a larger area than in 1901, and is extending inland. A third alien, which, though apparently established some years, does not seem to have been previously reported from St. Anne's, is a dwarf form of the American ragweed, *Ambrosia artemisiæfolia* (a somewhat aberrant composite), regarded as a pernicious weed on the other side of the Atlantic. It grows at St. Anne's in patches several yards in diameter, monopolizing the rough hollows of the sand-hills almost to the exclusion of the native vegetation. Its rapid spread is occasioned by its habit of giving off underground runners or stolons, sometimes over 4 feet long, from which upright shoots spring at intervals. It is suggested that, as fowls were formerly kept in the locality, fruits of the *Ambrosia* may have been included in grain-sweepings from the docks, with which the fowls may have been fed. The fourth adventitious species is a vetch, a near ally of *Vicia cracca*, which appears to be still rare, and, though found in every European country but Great Britain, seems now for the first time recorded from this country.

The Geological History of the Site of Salzburg.—An interesting investigation into the geology of the region upon which the town of Salzburg stands, and the history of its present relief, has been made by Herr Hans Crammer, at the suggestion of Prof. Penck. The Mönchsberg and the Reinberg, which overlook the streets of the western parts of the town and its outskirts, are chiefly composed of the so-called "Salzburger Nagelfluh." As the result of their own researches, Wähner and Fugger have concluded that this conglomerate formation is of preglacial age, while Penck, in 'Die Alpen im Eiszeitalter,' maintains that it is of interglacial origin. A study of some recent excavations has enabled Herr Crammer to show that Penck's view is the correct one, and members of the "glacier" excursion at the forthcoming Geological Congress will have an opportunity of examining the new exposures. In both the Mönchsberg and the Reinberg the "Nagelfluh" shows regular bedding, with a sharp dip, the strata resting on a bed of sandstone, which in turn lies on a mass of boulders and pebbles. Penck and Crammer have shown, from internal evidences, that this last is a ground moraine, and that it is older than the "Nagelfluh" is proved, not only by its lower level, which Crammer has traced inwards for 26 feet, but by the entire absence of stones or pebbles from the "Nagelfluh" within it. Crammer interprets his facts as follows: A retreat of the Salzburg glacier of the ice period caused the formation of a lake behind the terminal moraine to the north, as Penck has shown, and into this lake flowed the glacier water, the present Salzach. At the mouth of the stream a delta naturally formed, with its typical structure of a smooth, sloping cone. The core of the cone consisted of the ground moraine of the retreating glacier; this was covered first by fine sand carried in suspension by the stream, and then, as the delta grew lake-wards and the stream became faster, larger pebbles and stones were deposited. The earlier covering consolidated, after the draining of the lake, into sandstone, the low-lying sandstone of the Salzburg hills, and the later into the "Nagelfluh." The Mönchsberg and Reinberg are parts of an old delta built out by the glacier stream in a lake which filled the Salzburg plain between two projections of the glacier. The destruction of the once continuous "Nagelfluh" sheet has been effected, according to Crammer, by the action of both water and ice, and the working of the latter may be traced both in gradual grinding or abrasion and its sudden outbursts, several features of much general importance in the study of questions concerning glacier-erosion being observable. But under the protection of older and harder rocks the "Nagel-

fluh" remained undisturbed; the strata of the Mönchsberg dip towards the main dolomite of the Salzburg Festungsberg, and the Reinberg may owe its preservation to the same mass. On the outskirts of the town the "Nagelfluh" of the Hellbrunner hill joins the outcrop of a bed of the older "Gosaukonglomerat," and another relic of the old delta-covering is found in the "erosion shadow" of a hill of nummulite limestone.

The Development of the Vegetation of Central Germany.*—The author of this paper gives first his own views on the origin and development of the vegetation of to-day in Central Germany, and then criticizes very strongly the views held by Drude. He begins by discussing the early periods of the last ice age, when the country was covered with plants of an alpine and northern character, and but few representatives of the steppes of the preceding warm period were left. Of forest land there was little, but gradually, with the increase of warmth, *Picea excelsa* appeared, driving away *Pinus sylvestris*, *Betula pubescens*, *Larix europæa* and *Pinus cembra*, and itself giving way to *Fagus sylvatica*. The advance of the forest coincides with a retreat of the remaining plants of the coldest period. The increasingly warm climate with its heavy rainfall gradually, however, led to a period with a moister and colder climate. It is, however, impossible here to follow the author further in his very elaborate but comparatively short account of the series of changes in climate and vegetation which intervened between the last glacial period and the condition of things obtaining in Central Germany to-day, with its climate, typically continental, and its extensive forests. The author refers the reader to a series of his own publications, where the whole subject is dealt with more clearly than is possible in a short paper, more than half of which is made up of strong criticisms of the work done by other authors.

Zoological Research in the Adriatic.—An association for the advancement of scientific research in the Adriatic has been founded recently in Vienna. At the inaugural meeting, which was held in the university on March 24, the proceedings were opened by the Rector of the University of Vienna, Hofrath Gussenbauer, and after a speech by the president of the new association, Count Vetter von der Lilie, Prof. Berthold Hatschek delivered an address on "Marine Research." The work of the association, which will co-operate with the Government biological station at Trieste, will in the first instance consist in establishing and maintaining a marine aquarium at Trieste, and in fitting out a suitable steam-vessel for the scientific exploration of the northern part of the Adriatic.

Reafforestation in Italy.—A consular report on the trade of Naples dwells on the unsatisfactory condition of forest management in Italy at the present time. A forest law of 1877 empowered the withdrawal of 4,000,000 acres of forest land from reserve, as it was considered that a great quantity of land would thus be brought into cultivation. This proved to be the case, especially in the lower ground, and the result was that the forests of Italy were felled in a most reckless manner. It is now generally admitted that State aid must be called in if anything is to be done, and reafforestation undertaken. It is suggested that the cork tree would be the most profitable for the latter purpose. Apart from Italy, the cork production of the world is thus distributed:—

---

* 'Ueber die Entwicklungsgeschichte der gegenwaertigen phanerogamen Flora und Pflanzendecke Mitteldeutschlands.' By Aug. Schulz. Berichte der Deutschen Botan. Gesellschaft. Band xx. Berlin, 1902. 4°, pp. 54–81.

Country.	Area in acres.	Production (quintals of 220 lbs.).	Value of export.
			£
Portugal	741,000	275,000	689,000
Spain	617,500	328,000	1,400,000
Algeria	694,070	88,000	288,000
France	376,800	60,000	320,000
Tunis	197,600	7,000	24,000

Italy has about the same area as Tunis under cork forest, but she exports to the value of about £36,000. The Calabrian forests have been almost entirely destroyed, the trees having been burnt for charcoal.

ASIA.

Surveys in China.—On the termination of the Chinese disturbances in 1901, an important expedition was organized under Lieut.-Colonel Manifold and Captain Hunter, who set out from Peking for Suchwan on September 20, 1901, with the object of exploring the routes to the upper Yangtse valley from the north-east. Colonel Manifold recently gave some account of the earlier part of the journey before the United Service Institution of India, in whose journal for January last the paper is printed. While entering but little into details respecting the actual survey work accomplished (though this was of considerable importance, as the routes were in part entirely new), the paper is of interest from the light which it throws on the condition of the country and the attitude of the people on the morrow of the occupation of Peking and parts of the neighbouring provinces by the allied powers. Colonel Manifold found that a correct knowledge of the events of 1900 and 1901 had extended far beyond the area actually affected by the operations, no attempt being made, as after former defeats, to deceive the populace as to the real issue of the fighting. Although it might have been supposed that the recent disturbances would have made travel in the far interior less safe than usual, this was by no means the case, the officials feeling that they would be held responsible for the safety of foreigners, to whom, and especially to missionaries, an unusual amount of deference was shown. A widespread desire for the adoption of European methods and ideas, as the only means of maintaining a stand against foreign aggression, was also observable. From Peking the route of the Peking-Hankow railway was at first followed, and Colonel Manifold formed a high opinion as to the future commercial importance of the line, which, with its continuation to Canton, will tap the commerce of all the main waterways of China. The nations controlling this great highway must, he thinks, exercise a very great influence over the country on either hand. Beyond the Hwang-ho the loess country was entered, and the expedition experienced great difficulties in attempting to travel by any but the one trunk road through it, the peculiar vertical cleavage of the loess placing insuperable difficulties in the way of free communication. By making a short *détour*, in the environs of Honan-fu, the undesirable meeting with the court and its retinue, then returning from Sian-fu to the capital, was, however, avoided. The Lo valley, which was next ascended, had previously been unvisited by Europeans, while the crossing of the Chin-Ling range from Sian-fu to the Yangtse valley was likewise effected by hitherto unknown tracks, so that the geographical results of the journey will here be of considerable importance, especially as the expedition was accompanied by two trained surveyors from Rurki. The subsequent explorations in eastern Suchwan and Hupe are not touched upon in the paper, which concludes

by insisting on the need of prompt and energetic action by British capitalists, if the Yangtse valley is to be opened up by British enterprise.

Scientific Results of Dr. Sven Hedin's last Expedition.—The hope has more than once been expressed in the *Journal* that the means might be found to publish *in extenso* the very valuable scientific material brought back by Dr. Sven Hedin from his last expedition. This hope, we are pleased to state, is now about to be realized, the necessary funds, amounting to 75,000 kroner, or about £4000, having been voted by the Swedish Riksdag in March last. The decision was arrived at "utan votering" (without voting), and the Riksdag is to be complimented on the enlightened aid which it has thus once more given to the cause of science. The general plan of the work, which it is hoped to publish within three years, has already been sketched in the *Journal*. Dr. Hedin himself will contribute two large volumes on the purely geographical results, while the more special branches of science will be dealt with by specialists, who are already working up the material. The work will be published in English, and will no doubt be largely subscribed for in this country.

Earthquake of Andijan.—It appears, from the exact official figures concerning the last Andijan earthquake, that the total number of persons who perished during the earthquake was: 1021 in the town of Andijan, 3342 in 158 villages of the district of Andijan, 285 persons in 106 villages of the district of Marghelan, and four in the district of Osh. Total, 4652 persons. The numbers of cattle killed were also very great, namely, 1375 in Andijan, 4693 in its district, 518 in the district of Marghelan, and 139 in that of Osh. Total, 6725. The number of houses destroyed reaches 34,882, namely, 123 and 9526 respectively in the Russian and the native portions of Andijan, 17,913 in the villages of the Andijan district, 5622 in the Marghelan, and 795 in the Osh district.

The Trans-Siberian Railway.—From the report of the last meeting of the Board of Directors of the Siberian Railway, it appears that the main line is now completed permanently except for the portion circling Lake Baikal, which it is hoped will be finished by the close of 1904. The total cost of the line, including the Baikal section, amounted to nearly 385,000,000 roubles. The number of immigrants who have had grants of land allotted to them is 611,494, and for colonization purposes a sum of 30,000,000 roubles has been assigned. To facilitate the acquisition of agricultural implements and seeds, etc., twenty-nine depôts have been established. Arrangements have been made for an efficient prospecting of the country in the neighbourhood of the railway, with the view to the development of its mineral resources, and these have already led to the discovery of oil in the vicinity of Sudjenka, in central Siberia, and near Cheremkhovskoje, in the province of Irkutsk. A special grant has also been made for the encouragement of gold prospecting, and an investigation of the Yenesei and Obi has revealed the fact that these rivers are navigable for ocean steamers for a distance of nearly 1000 miles.

Trade Routes in Siam.—In the report of H.M.'s Consul at Chiengmai it is stated that full surveys are now being carried on, and are almost completed, in connection with the projected main line of railway from Bangkok to the north. This was originally intended to run through Paknampho to Utaradit and Phré, and thence north-westwards to Lampang. Chiengrai, the trade centre on the Me-kok, through which all the Yunnan trade passes, is the ultimate goal. The present surveys, it is understood, favour a direct route along the west bank of the Me-yom, tapping the plain around the prosperous towns of Sawankalok, Pichai, and Pitsanulok, and going nearly due north to Lakhon-Lampang. This town, which is distant 203 miles from Paknampho, is likely to be the centre of the

northern railway system. The line will be extended, not north-easterly by Muang Ngao and Prayao, as originally intended, but somewhat north-westerly along the Me-tui, an affluent of the Me-wang, and across or through the very slight watershed separating the Me-wang from the Me-lao in the Mekong basin into the fertile and populous valley of that stream, where construction would be free from all engineering difficulties right up to the walls of Chiengrai, a distance of about 130 miles from Lakhon-Lampang.

The Late Drought in Cyprus.—The official correspondence relative to the late drought in Cyprus has been published, and shows that the meteorological conditions last year were more unfavourable than at any previous period since the British occupation. In the beginning of June the high commissioner reported that the entire rainfall for the preceding twelve months in the Mesorea plain only amounted to 6·17 inches. The drought was generalized, but was chiefly felt in the Mesorea, which is the principal cereal-producing district. According to a series of records of the island rainfall appended to the report, it seems that the average amount of rain which falls at Nicosia from October to February inclusive —the rainy season—is 10·5 inches, this being the mean of observations from the year 1881. In the winter under consideration, however, the fall recorded during this period was only 3·78 inches. The year 1888 was likewise a drought year, only 5 inches falling during the corresponding period. Turning to the other districts, the deficiency is hardly less striking. In Larnaka 3·17 inches fell, instead of the average 11·27 inches—considerably less than one-third. In Limassol the amount recorded was 6·68 instead of 14·43 inches, and in Famagusta and Kyrenia the figures were 4·14 and 7·84, as against 13·34 and 17·26 respectively. Papho was the only district which did not show a rainfall lower than any previously recorded, but even here only two-thirds of the average fell. Relief works were established and are being maintained until next harvest, the aggregate number employed at the different centres averaging about 2000 daily. Money assistance is also given by Government to solvent farmers who have sown largely, and are without any grain for food.

AFRICA.

The Position of Fort Jameson.—To the longitudes determined in Central Africa by the aid of the telegraph, we may now add that of Fort Jameson, in North-Eastern Rhodesia, which was fixed in December last by means of signals sent from Kimberley at the instance of Sir David Gill. We have been favoured by the Foreign Office with a copy of the letter sent by Mr. Codrington to the South Africa Company, in which the exact method adopted for the determination of the position is described. Local mean time was obtained on December 4, 11, and 17—of the 4th and 17th by equal altitudes of the sun, and on the 11th by ten altitudes taken in the morning and ten in the afternoon. Signals from Kimberley were received on the 6th, 10th, and 16th, the local mean time being, of course, obtained—in the absence of actual observations on those days—by the chronometer rates determined on the 11th and 17th. The resulting longitude in time was 2h. 10m. 40·42s. on the 6th, 2h. 10m. 40·59s. on the 10th, and 2h. 10m. 42·97s. on the 16th. Owing, however, to the considerable variation of the figure for the last date from those of the two first, the longitude has been assumed to be 2h. 10m. 41s., or 32° 40′ 15″ E., which gives a position about 3½m. west of that shown on the War Office map. The latitude, calculated from the meridian altitudes of two pairs of stars, north and south, is 13° 38′ 12″ S. The observations were taken by Mr. Wallace, chief surveyor, with an 8-inch sextant.

Meteorological Institutes in South Africa.—A meteorological head-station has been recently established in Bloemfontein, and sub-stations are being arranged for in Harrismith, Kroonstad, Heilbron, Bethlehem, and Bethulie, it being intended to send the records from these various stations to Bloemfontein. Observations taken so far show remarkable variations of conditions throughout the Orange River Colony, both with regard to the stations as compared with one another, and also to the conditions obtaining in the different stations.

Uniform Time for South Africa.—The Colonial Office gives notice that a uniform time, based on the 30th meridian, or two hours east of Greenwich, has been adopted by all the South African Governments, with the exception of German South-West Africa. On February 28 last, at 11.30 p.m., the time was advanced to midnight in the Transvaal, and similar steps were taken in the other South African colonies, except in Natal, where no change was necessary.

The Du Bourg Expedition.—After the death of its leader (*ante*, p. 319), this expedition continued its route, with some modification of the original plan, under the leadership of M. Golliez, and made its way to the coast by way of the Congo and Brazzaville, reaching France about the end of March (*Revue Française*, April, 1903). From Amadis, the scene of the death of M. Du Bourg, the survivors made their way down the Welle, of which a survey was made from the confluence of the Kibali and Dugu. Its course was found to be very tortuous, and to have been very inaccurately shown on previous maps, so that the survey will be of considerable value for African cartography.

Explorations in French Congo.—M. Alexis Rousset, who last year undertook an expedition for the survey of a route from the Congo to the Shari by way of the Bahr Sara, the important south-western branch of the latter river, has, we learn from the *Revue Française* for April, died on his return to the coast after successfully completing his mission. The route surveyed leads by the Fafa, a tributary of the Bahr Sara, and is said to shorten the journey to the Chad basin from the south by 200 kilometres (125 miles). The Fafa was found to be broken by two rapids only, and to be otherwise suited for navigation. M. Rousset had previously done other good work in this region. Additions continue to be made also, in points of detail, to our knowledge of the Congo tributaries in this region. Thus we learn from the *Mouvement Géographique* (1903, No. 11) that a further exploration of the "Likuala aux herbes," between the Sanga and Ubangi, has been made by M. Vasseur, who ascended the river in a steamer to a little north of 1½° N. lat. At this point it was still 30 yards wide and over 10 feet deep, flowing at the time through an inundated forest, though it sinks to an insignificant stream in the dry season. The natives in this part were hostile, but lower down were more friendly, and showed no fear or surprise at the sight of the steamer. In a map which accompanies the note, account has been taken of the work of the recent Franco-German boundary commission (*ante*, p. 457), which shows that the Sanga and Ubangi are closer together than has been supposed. The thirteenth number of the same journal gives a short account of a recent exploration, by Captain Scheerlinck, of the Pama, an important upper branch of the Alima, first explored in 1883 by Dr. Ballay. It flows for a long distance from south-west to north-east, parallel to the upper Alima.

Exploration of Southern Angola.—It is stated in the *Deutsche Kolonialzeitung* (No. 14, 1903) that the results of an expedition sent out in 1900 by Kolonial-wirtschaftliche Komitee, in association with the Companhia de Mossamedes and the South-West Africa Company of London, are about to be published in a full report by experts on the subjects to which attention was mainly directed, viz. the economic resources of this part of West Africa. The district explored

was the *Hinterland* of Mossamedes, especially the region between the Kunene and Zambezi, and it is stated that the new light thrown on the botany of this country is of special importance, no expedition since the days of Welwitsch and Schweinfurth having brought back botanical collections of such value, while the studies of economic plants, especially rubber, are also of great interest. The expedition referred to seems to be that of which mention was made in the *Journal* for December, 1899 (p. 665), though authority was there given for the statement that it started in August of that year, and not in 1900. The leader of this expedition was the botanist, Dr. Baum.

The Spanish Colonies in West Africa.—In the *Bol. de la R. Soc. Geogr. de Madrid* Sr. E. d'Almonte gives the following areas and populations:—

	Area in sq. m.	Pop.
Continental territory	9890	137,000
Fernando Póo	800	19,542
Annobon	6¾	1,303
Corisco	5½	732
Elobey Isles	1	313
Totals	10,703¼	158,890

The areas are only approximate, and the population of the continental territory can only be a very rough estimate, and is probably too large. The population of Fernando Póo is taken from the census of 1901. The white inhabitants are very few, namely, 501 in Fernando Póo, 6 in Annobon, and 12 in Corisco. The continental territory, definitely secured to the Spanish crown by the Franco-Spanish treaty of 1900, extends along the coast from 1° to 2° 10′ N. lat., between the rivers Muni and Campo. The coast consists of plains or undulating country, beyond which, about 12 miles from the sea, are heights culminating in the Pico Agudo de las Siete Montañas at a height of 2790 feet. La Mitra, between the rivers Congüe and Utongo, rises to 3940 feet, and the culminating height of the territory lies between the Laña and San Benito, attaining some 5900 feet. The rivers are much encumbered with falls and rapids, but the Campo is navigable for some 12 miles from its mouth up to the cascades of Bina by steam-launches, though its bar is difficult to cross, and the San Benito (or Volo) to the cascades of Yobé. The Muni is an estuary into which several rivers flow, and has a maximum depth of 108 feet near the French shore, but vessels entering it must have a draught of less than 20 feet in order to cross Corisco bay. Archæan and Palæozoic rocks seem to predominate in the interior of the country, and secondary formations extend along the coast covered with quaternary deposits. The whole country, except some parts of the coastal belt, is clothed with dense forest, where all the trees and plants of tropical Africa flourish—timber trees, dyewoods, fibres, indiarubber, gums, oil, and coco-palms, etc., and various fruits. Manioc, sweet potatoes, yams, maize, etc., are cultivated to a small extent by the natives, and vanilla, cocoa, and other plants near the settlements. The country is little developed, and the exports consist chiefly of palm oil, indiarubber, mahogany and other timber. The hot and moist climate renders the country unsuitable for European colonization, and the chief settlement, the so-called town of Bata, is only a row of houses along the coast, in spite of the efforts made by the French to foster its growth. There are a few factories in Bata of various nationalities, and others are established on the Rio Muni.

Stationary Dunes in the Sahara.—In the *Comptes Rendus* of the Paris Academy of Sciences (meeting of February 6, 1903), M. Hochreutiner has a note on a special type of dunes on the margin of the Sahara, which differs from the

normal in showing no tendency to move in the direction of the prevailing wind. A good example is that of Ain Sefra, which owes its origin to a local wind-current blowing down the side valley of the Feijet-el-Betum across the longitudinal valley of the Wed-el-Brij, and depositing the sand which it raises on a well-defined area, adjoining, though not touching, the southern wall of the latter. Although quite stationary, the dune presents all the external characters of moving dunes. The writer considers that attempts to fix this dune are unnecessary, though the plantations which have been established are important, from the fact that every inch of soil gained is of value from an agricultural point of view.

AMERICA.

North-Western California.—An examination of the north-western region of California, with a view to testing its capabilities for stock-rearing, has lately been made by Mr. J. B. Davy, of the agricultural experiment station of the University of California, and his report, issued last year at Washington, contains much interesting information on the surface features of the country. North-western California, as a well-marked topographical area, is defined as lying between 39° and 42° N. lat., and between the coast and the inner coast range mountains. Of the seven agricultural and climatal areas into which it may be subdivided, Mr. Davy's examination extended to four, viz. the Interior Plateau belt, the Coast Bluff belt, the Redwood belt (lying between the two first), and the district at the headwaters of the Russian river, which forms a connecting link with the topographical region of Western Central California. The general character of the region is that of a dissected plateau, the Coast Bluff belt having a width of only from 1 to 3 miles, while the Redwood belt seems distinguished rather by its climatal than its topographical features, though the causes which delimit the growth of the forest are not clearly understood. In the plateau belt there are numerous mountain valleys which, by their cool climate, fertile soil, and abundant supply of water and timber, are eminently adapted for dairying, though little is at present done owing to difficulty of transport. The original vegetation has been much modified by farming operations, and even in the wild pastures many valuable native species have been much reduced by heavy grazing, while weedy species have become naturalized. Systematic efforts are needed to improve and renew the pastures, which throughout this belt of country have much deteriorated. The upland ridges of the plateau furnish a still larger area of pasture, being not fitted for general agriculture. They form the summer or annual pastures, while winter feed is found among the woodlands which clothe the gulches and steep sides of the cañons, the principal trees being Douglas spruce and three kinds of oak, one of which is highly valued for its bark. These timbered lands cannot, however, make first-class pastures, though something may be done to improve the open spaces. But, as the writer insists at various parts of the report, the timber and brush are most important for the preservation of the water-supply. Other types are the "Chaparral" areas—consisting of dry, stony ground covered with a dense brush of prickly or rigid shrubs—and the sub-alpine meadows, which, being completely isolated, retain the character of the primitive flora. They are valuable as supplying green pasturage for several weeks after the lower upland pastures are dry and brown. The soils on the coast bluffs or "mesa" lands differ materially from those of the plateau and valleys, but, though little suited for sheep, supply some excellent cattle ranges. The coast is fringed with sand-dunes, and Mr. Davy enters fully into the question of their planting with sand-binding species. Some of these have a certain forage value, but the wisdom of stock-feeding on reclaimed dunes is doubtful. Grasses are scarce in the Redwood belt, which, as a rule, is densely shaded, and clearing is, of course, opposed to the interests of the lumber trade.

AUSTRALASIA AND PACIFIC ISLANDS.

Recent Work in New Guinea.—The Annual Report for 1900–1901 on British New Guinea, issued last year at Brisbane, contains, as usual, a large amount of interesting matter relating to the country and its inhabitants, though the multitude of subjects treated of makes it a matter of some difficulty to sift out the geographical items from the mass of other matter. The Reports of the Lieut.-Governor on his visits of inspection are of interest principally as showing the general progress towards the development and pacification of the territory, the statements as to the progress of planting in various parts being on the whole encouraging. Among other visits paid during the year, those to some of the island groups in the extreme east, and that to the Aird River delta for the investigation of the murder of Mr. Chalmers and his companions, may be specially mentioned. In describing a visit to the north-eastern division, the Lieut.-Governor gives a striking description of the Goropu range, the highest point of which, some 10,000 feet high, has recently been named "Mount MacGregor." A new Government station for this division has been founded on Tufi inlet, just north of Cape Nelson, and a photograph taken from this station looking up the winding inlet to the imposing peaks, Mounts Trafalgar and Britannia, is reproduced. Various reports by subordinate officials describe journeys into the interior, some of which have resulted in considerable additions to our knowledge. The expedition from the coast near Cloudy bay across the main range to the headwaters of the Musa has already been referred to in the *Journal*, but attention may be called to the photograph of the gap in the Mount Suckling range through which one of the upper branches of the Musa cuts its way to the north. Further light on the upper system of the Musa was thrown by an expedition which started from the shores of Collingwood bay, on the north-east coast, with the object of discovering and punishing the interior tribes whose murderous raids have long been the terror of the dwellers on the shores of the bay. They have been generally known on the coast as "Doriri," and the expedition proved that, as had been conjectured, this name is a general designation for the unruly tribes dwelling on the headwaters of the Musa. The route led round the northern base of the Goropu range, through a district in which many of the streams flowed with a thick milky-looking water, while in traversing their wide flood channels the traveller sometimes sinks to the knees in a kind of pipeclay slush. These strange waterways are attributed to landslips in the Goropu range, which hold back the water, until it at last bursts forth carrying devastation in its train. The banks of one of these streams, the Wakioki, were thickly clothed with Casuarinas, while on the spurs of the range grew huge mountain pines towering high above the other tall forest trees. After crossing the divide to the Musa system, good views were obtained of the graceful Mount Macgregor and the more massive Mount Suckling a little further south. The Musa and its tributaries were found to be deep and impetuous streams, the crossing of which involved considerable difficulties. The headwaters of another of the north coast rivers—the Kumasi—were investigated by Mr. A. L. Walker, who, in spite of severe fever, made his way for some distance into a broken mountainous district in the vicinity of Mount Lamington, in the Hydrographer's range. This, as well as a portion of the main range, was found to be drained by the branches of the Kumasi, where the supposititious course of the Yodda has hitherto been marked on the map. The Kumasi is a turbulent stream, and Mr. Walker was nearly drowned when attempting to descend on a raft, his native followers restoring him by a process of artificial respiration. In its lower course the river flows through a fertile, thickly peopled country. The report contains many details on the natives and their customs, and there are numerous photos showing their houses (some raised on bamboos

to a height of 30 feet from the ground), carvings, boats, etc. A strange custom which was found to exist among the Fly river natives, and which has been the cause of much trouble, is to the effect that if a "big" man of one village has during his lifetime been a great friend of another village, he makes a secret agreement with the latter to kill all the people of his own village when he dies.

Rainfall of the British Solomon Islands.—Mr. C. M. Woodford gives some information concerning the rainfall of these islands in his lately issued report to the Colonial Office. Records have now been kept at the Government station, Tulagi, for nearly five years, so that some material exists towards obtaining an average. It is customary to speak of the months from April to November as the "dry season," and those from November to March (inclusive) as the "wet season." This coincides with the period of the change of the south-east to the north-west monsoon, and appears to be tolerably well borne out by the records obtained. Roughly speaking, it seems that February and March are the wettest, and May, June, and July the driest months. The annual average for the four years ending with 1901 was just under 130 inches, and this seems to be about what is obtained at Santa Anna and at Ugi, judging from the scanty data available for these latter places.

PHYSICAL GEOGRAPHY.

Temperature in Underground Passages.—Herr Fred. de Bruijn has taken numerous observations of the temperature in the St. Pietersberg quarries near Maestricht (*Tijdschrift van het K. Nederl. Aardrijksk. Genoot.*, Deel xx. No. 1). The average annual temperature is about 48° Fahr., but along the eastern side of the hill, near the chief entrances, it is somewhat less, lying, both in winter and summer, between 44°·5 and 46°·5. The temperature therefore differs considerably from that of Maestricht, where the annual mean is 52°. The cause of this difference is probably evaporation. In winter, when the outer air is colder than that in the quarries, moisture may be given out, and the air in the subterranean passages, absorbing fresh moisture from the damp stone, may be cooled. Evaporation is also caused by convection currents. These are especially marked in the Boschberg and Valberg quarries, on the other side of the Jeker river. The former has eight openings on a level with the passages, and the temperature in these varies with the seasons, while the Valberg has only one opening at a higher level and a more constant temperature. A narrow opening connects the two, through which currents of air flow, the warmer air of the Valberg pouring out in winter into the Boschberg. When the weather is cold, volumes of vapour rise from the Valberg entrance.

The Currents of the Bay of Biscay.—In the January number of *La Géographie*, M. Charles Bénard, president of the Société de Océanographie du Golfe de Gascogne, gives an account of some further experiments with "drifters" carried out by the society. The special feature of the investigation was that the drifters were thrown into the sea in a region intermediate between the open sea area investigated by the Prince of Monaco and the inshore region investigated by M. Hautreux. The results confirm the conclusion that the "Rennell current," properly so called, does not exist, and show that a branch of the general Atlantic circulation enters the Bay of Biscay from the north, flows south-eastwards to the Landes coast, recurves westward along the north coast of Spain, where it moves at the rate of about 3 to 6 miles a day, and then turns southward along the Portuguese coast, rejoining the main current towards the Azores. The society is about to undertake further researches in the north of the bay, and its results in that region may be of special value in relation to the work of the International Survey in the English channel

The Effects of Snow-covering.—The *Bulletin* of the Geological Institution of the University of Upsala (No. 10, 1901) contains an account of an important investigation on the physical conditions of a snow-covering, and its influence on the soil on which it rests, carried out at the Upsala Observatory by MM. Jansson and Westman between January and April, 1902. The observations were made daily at two independent stations, and include (1) records of depth of snow, (2) temperature of snow and soil, (3) specific gravity of the snow, (4) influence of evaporation and condensation on the thickness of the snow-covering, (5) the melting of the snow. Increased depth of snow is due either to snowfall or to drifting; the depth is diminished by internal changes in the density of the snow, which occur even when there is no melting, by the access of warmth due to rain, warm winds, or solar radiation, and by drifting. The heat effect of warm rain is of little importance compared to that of a warm wind. A comparison of the thickness of the snow-covering with the amount of precipitation gives as a mean result, that 1 centimetre of snow is equivalent to 1 millimetre of rainfall. The temperature observations show that, while in a thin layer at the surface the minima are considerably lower than those of the air, on account of radiation, the snow is in general warmer than the air, so that, while a thin coating of snow reduces the temperature of the soil at the surface, a covering 30 to 40 centimetres thick affords great protection. During the whole winter temperature never fell to the freezing-point 10 centimetres below the surface of snow-covered soil, while on ground kept clear of snow it was below freezing from January 31 to April 1 at a depth of 50 centimetres. The specific gravity of the lower layers of snow showed a fairly steady increase from 0·295 on January 11 to 0·372 on April 5, comparison with observations in 1901 showing that the increase depends, to some extent, on the total thickness. The specific gravity of newly fallen snow ranges from 0·038 at low temperatures to 0·161 under humid conditions. On a hard crust formed by melting, the specific gravity rose to 0·489. In the observations of evaporation and condensation wonderfully concordant results were obtained, confirming previous conclusions that in general the effect on the thickness of a snow-sheet from this cause is very slight.

The French Glacier Commission.—The *Commission Française des Glaciers*, instituted in July, 1901, has issued two papers reprinted from the *Annuaire* of the French Alpine Club for 1901. Prof. M. W. Kilian reports on the variations of the glaciers of Dauphiné and the Haute Ubaye observed in 1900 and 1901 by the organization carried on by the *Société des Tourists du Dauphiné*. The report is illustrated by a map and some excellent photographs. The observations show a general diminution of all the glaciers: Prof. Kilian expresses the opinion that the glaciers of the Marinet *massif* have reached a phase of specially rapid decrease, and that they are destined to disappear entirely. All the glaciers of the region are, in effect, entering upon the final stage of a retreat which, notwithstanding minor variations, has been going on continuously since the beginning of the quaternary period. The second paper, by M. Charles Rabot, is a short review of recent additions to our knowledge of glacial phenomena. The first chapter discusses the general aspects of the physical and geological problems under investigation, and in treating the subject of moraines and morainic deposits, M. Rabot deplores the confusion in terminology which still exists, and urges the adoption of the nomenclature recommended by the Glacier Conference in 1899. In the second chapter the most important explorations of glacier regions made during recent years are recorded, and the special features of each region described. The third chapter deals with variations of glaciers, a subject to which M. Rabot returns at greater length in an "Essai de Chronologie des Variations Glaciaires," published in the *Bulletin de géographie historique et descriptive* (No. 2, 1902).

GENERAL.

The Government of Tropical Colonies.—Mr. Alleyne Ireland, author of a well-known work on 'Tropical Colonization,' is at present travelling in the Far East on behalf of the University of Chicago, for the purpose of studying on the spot the problems of colonial administration in the various tropical colonies in that region, and the manner in which they have been solved. Some of the main results of his studies are being communicated to the New York *Outlook* in a series of articles, the first of which appeared in the issue of that paper for November 22 last. This first article sums up in a telling way the main principles underlying, in the author's opinion, the question of colonial administration in the tropics, and its main points may be here summarized. Mr. Ireland begins by insisting on the fact that civilization is the product of geographical environment, and that of the unchangeable factors of such environment which are of primary importance in the problem, climate is the one which has the most marked effect in differentiating existing civilisations. Defining as the "heat belt" of the globe the area enclosed within the northern and southern isotherms of 68° Fahr., he finds that, apart from the work of Europeans and Americans in the tropics, the civilization of the heat-belt has remained stationary a thousand years, and that the advancement of humanity during that period has been carried out entirely by the dwellers outside the limits fixed. This overwhelming disparity, which must be taken into account by all students of colonial problems, is not, in his opinion, a condition which may be subject to reversal, but is the result of definite laws. The beginnings of civilization must be sought either in countries where, from the nature of the climate, the labour conditions have been favourable to the production of a steadfast thrifty people,* or where, from the nature of the soil, the return to labour was great and favoured the easy accumulation of wealth. The latter cause is the more rapid in its action, and we therefore find that civilization appeared first in the early tropical states—India, Egypt, Peru, etc.; but depending on the fertility of the soil, and not on the energy of man, it carries the seed of its own destruction, and is supplanted by the more permanent civilization evolved from successful conflict with nature. In applying these principles to existing problems of colonial administration, Mr. Ireland holds that the character of such administration must be controlled by the ideals of the dominant power, and that in tropical colonies, whatever ideals—native or Western—are to prevail, the substantial control must remain in the hands of the representatives of such ideals. In his second paper Mr. Ireland studies the problem as it is presented in Hong Kong, and shows that, in spite of exceptional difficulties, England has achieved a work which can only call for admiration.

A Sixteenth-century Cartographer.—From the publishing house of Carlo Clausen in Turin there comes a pamphlet entitled 'Notizie sulla vita e sulle opere di Giacomo Gastaldi,' with a preface by Prof. Luigi Hugues. About the life of Gastaldi there exists considerable speculation. He was born at Villa Franca, in Piedmont, but lived mostly at Venice. So much is known with certainty, for his fame secured for him mention by chroniclers both contemporary and subsequent; but the details are hard to fill in. His relations with the Church are interesting in their uncertainty. It has been supposed that he was a friar or canon regular of the Premonstratensians (an order founded by St. Norbert), but in

* Mr. Ireland regards extreme heat as an equally effective bar to civilization as extreme cold, the extreme dryness of the soil in summer rendering continuous labour throughout the year impossible. This is, however, far from applying universally in the tropics.

this case he would not have been permitted to reside as he did in Venice, or indeed in Italy, without a special dispensation; and there is no record that he received this mark of favour. It does not, however, appear impossible that this recognition of Gastaldi's altogether exceptional talents would be denied him, for the highest interests in Venice at that time tended towards geographical work. Venice, lying as it did at the junction between the sea-way of the Adriatic and the land-ways north through Brenner, and east across the low Alps to the Semmering, was forced, by its commanding position for trade, into the necessity for a detailed knowledge at least of the Mediterranean coasts, for in this sea lay all its interests and its colonies. And Venice, at the period of Gastaldi's career, was experiencing a great geographical renaissance—a last outburst of activity in the close study of its own world and the world beyond, before the decline of its political power. Gastaldi had many masters under whom to study, and the best proofs of his extraordinary ability are furnished in the eleventh chapter of the present pamphlet. Here are to be found comparative tables of Gastaldi's computations of the positions of several well-known points both within and without the Mediterranean area, with which are contrasted modern results and those of Mercator and the geographers subsequent to Gastaldi. A geographer of four centuries back who errs only 5′ in computing the latitude of a point relatively so far distant from his own known area as Cape Verde (Mercator's error was 1° 13′) is entitled to high esteem. His workings of longitude are, as would be expected, further away from modern results than those of latitude, but his error of 9° for Bab-el-Mandeb is altogether exceptional; and it is in comparison with the work of other early geographers that Gastaldi shines most notably.

Medals of the Imperial Russian Geographical Society.—At its annual meeting, the Russian Geographical Society awarded its Constantine Gold Medal to P. K. Kozloff for his last researches and geodetical measurements in Tibet, his excellent maps, and most valuable zoological and botanical collections. The Count Lütke medal was awarded to N. M. Knipovich, for his researches in the Arctic ocean, and to N. A. Sokoloff, for his geological and geographical work. The large gold medals of the section of Ethnography were awarded to Prof. V. A. Zhukovsky, for his work on folk-lore in Persia, and to V. N. Perets, for ethnographical work. The Semenoff Medal was given to L. I. Brodovsky, for the map of Manchuria which he has compiled. Small gold medals were given to A. K. Kuznetsoff, for the work he has done in the museum of the Chita (Transbaikalian) section of the Geographical Society; to V. H. Ladyghin, for his work during the Kozloff Tibet Expedition; and to L. S. Berg, for his exploration of Lake Aral. A number of silver medals for various minor works were given to several persons. The greatest achievement of the Geographical Society was the visit to Lhasa by a member of the Society, the Buryat Lama, M. Tsybikoff, who has also been at a number of monasteries in Tibet, and has brought back 319 volumes of various works of Buddhist philosophy, medicine, history, and so on.

New Geographical Society.—The first meeting of the newly-founded Russian Society of Earth-Knowledge (*Obshestvo Zemlevyedeniya*) took place on March 5 at St. Petersburg (cf. *Journal*, vol. xix. p. 763). The Society is connected with St. Petersburg University, and has the following programme: (*a*) The study of scientific questions of Earth-knowledge; (*b*) geographical exploration in general, and especially local; (*c*) the improvement of methods of geographical education; and (*d*) the spreading of geographical knowledge. Prof. Brunov was elected as president of the Society, D. A. Koropchevsky as vice-president, and MM. Zverintseff and Schönberg as secretaries.

OBITUARY.

Dr. Gustav Radde.

We regret to announce the death of Dr. Gustav Radde, Gold Medallist and Honorary Corresponding Member of the Society. Gustav Radde was born on November 27, 1831, in Danzig, the son of a schoolmaster. As a youth he was befriended by Dr. A. Menge, and assisted by the Natural History Society of his native town to start on a scientific career. Still quite a young man—that is, in 1852–1855—he had the good fortune to be employed in the Crimea by the old botanist Steven in collecting plants and as a draughtsman for making drawings of plants. Under the guidance of his enthusiastic master, Radde travelled on foot over most of the hilly parts of the Crimea. During that time he also made the acquaintance of a local landowner, M. Shatiloff, for whom he made a Natural History Museum, which, at a later date, was presented to the Moscow University. During these years he published several valuable articles in the *Bulletin de la Société des Naturalistes de Moscou* ("Versuch einer Pflanzenphysiognomik Tauriens," 1854; "Beiträge zur Ornithologie Russlands," 1854; "Thierleben am Faulen Meere," 1855), and one on the Crimean Tartars in the Journal of the Russian Geographical Society (1857). Botany, zoology, and ethnography were thus already his favourite subjects.

In 1855 began the great period of exploration of Eastern Siberia. Steven recommended Gustav Radde to the Geographical Society for this task, and in that year Radde went as a botanist and a zoologist to that country and to the newly annexed Amur region with the expedition under Ludwig Schwartz. He travelled there for four years, made the tour of the northern part of Lake Baikal, then almost unknown, observed the migrations of birds in Transbaikalia, and spent a full year in the Little Khingan, studying the fauna and the vegetation of the southern portion of the Amur. In 1858, after the expedition had terminated its work, he made an extremely interesting journey to the highlands of the Sayan (Irkut valley) and to the peak Munku-Sardyk, the only snow-clad peak on the frontier of Eastern Siberia. The collections which he brought in from Siberia were immense, and included specimens of 1760 vertebrates and about 50,000 invertebrates.

The results of these journeys are embodied in two quarto volumes of his 'Reisen im Süden Ost-Sibiriens' (I. 'Die Säugethierfauna,' 1862; II. 'Die Festlands-Ornis,' 1864), published by the Russian Geographical Society and containing the description of his extremely valuable zoological collections, and in a volume of shorter reports, entitled 'Berichte über Reisen in Süden Ost-Sibiriens,' published in vol. xxiii. of Baer und Helmersen's 'Beiträge zur Kenntniss des Russischen Reichs,' 1861. These reports are admirably written, especially in the part which deals with Radde's journeys up the valley of the Irkut and to the Munku-Sardyk and the Chohondo region. His intelligent study of the method of Humboldt is perceptible in these reports, and they are the best specimens in all the modern geographical literature of Siberia of a graphic description of the whole of nature, physical and organic, including man, as it appears in these highlands. Strangely enough, these 'Reiseberichte,' which might have been such good guides for Russian travellers, have not been published in Russian, but there are Russian editions of the 'Reise.'

In 1864 Radde moved to the Caucasus, where he soon grew interested in the fauna, the vegetation, and the inhabitants of that fascinating and varied region, and founded at Tiflis a Natural History Museum, to which for the rest of his life he devoted his main activity, and which he made one of the richest and best of local museums. He was also the director of the Tiflis Public Library.

His main literary works on Caucasia were 'The Ornithological Fauna of Caucasia' (in Russian) and 'Ornis Caucasica,' which he began to issue in 1885 at Cassel, and of which he published several fascicules, and his 'Berichte über die biologisch-geographischen Untersuchungen in den Kaukasusländern' (Tiflis, 1866). He published, both in German and in Russian, a great number of separate sketches of his journeys, which appeared, in German, in *Petermanns Ergänzungshefte* and *Mitteilungen*—such as "Vier Vorträge über den Kaukasus" (*Ergzh.*, No. 36), "Aus den Hochalpen des Daghestan" (*idem.*, 85), "Karabagh" (*idem.*, 100), "Das Ostufer des Pontus" (*idem.*, 112), "Der Nordfuss des Daghestan" (*idem.*, 117), or in separate volumes, "Khevsuria and the Khevsurs" (Cassel, 1878), 'Talysch und seine Bewohner' (Leipzig, 1885); while in Russian he published a number of smaller monographs in the *Memoirs* (vols. vii., viii.) and the *Izvestia* of the Caucasus Geographical Society (vols. ii., iv., v.), as also in the Caucasian *Kalendar* (Russian). He also made a journey to the Transcaspian region, described in his 'Preliminary Reports of an Expedition to the Transcaspian Region and the Khorassan,' published (in Russian) at Tiflis in 1891.

In all these works Radde gives excellent and lively pictures of the lands he visited—their fauna, their flora, and their inhabitants—though less beautiful, it must be said, than his Tunka and Munku-Sardyk pictures. He wrote also a good general article, "The Caucasus," for 'Picturesque Russia,' and a sketch of his sea voyage round Asia, 'Twenty-three thousand miles on board the Yacht *Tumara*.' Of his scientific work during the Transcaspian expedition, the first volume only has been published (in German), under the title of 'Wissenschaftliche Resultate der Transcaspischen Wissenschaftlichen Expedition: Band I. Zoologie.' His most important botanical work concerning the Caucasus was 'Grundzüge der Pflanzenverbreitung in den Kaukasusländern,' which constitutes the third volume of the well-known 'Vegetation der Erde,' edited by Profs. Engler and Drude. This is a very serious and most valuable work.

At the time of his death he was engaged in the publication of a work 'Die Sammlungen der Kaukasischen Museums,' of which three volumes (out of six) have appeared (Zoology, Botany, Geology).

In 1898 the Russian Geographical Society awarded to Dr. Radde its chief medal—the Constantine medal—the analysis of his work having been written by Prof. Kuznetsoff (see 'Yearly Report of the Russian Geographical Society' for 1898). He had been awarded the Patron's Medal of the Royal Geographical Society in 1889.

Some of the preliminary reports of Radde, written almost on the spot or immediately after this or that journey in the Caucasus and elsewhere, were from time to time criticized by specialists for small mistakes which he had made here and there. They remain, nevertheless—especially the Siberian reports—models of what reports of journeys ought to be for giving a general picture of the nature of the country visited, embodying its vegetation, its fauna, and the manner of life of its human inhabitants. The writer of these lines cannot recommend any better reading for young geographers than Radde's Siberian 'Reiseberichte;' and if some day a collection of the best geographical reports be made for the use of geographical students—which would be a most desirable enterprise—Radde's reports will surely occupy in such a collection an honourable place. P. KROPOTKIN.

A few days ago I received from Dr. Radde a volume, with a card, "Best greetings; suffering much, but hope to finish the Geology." Before it reached me, the announcement of his death had appeared in the newspapers. For old acquaintance sake, I should like to add a few words to the notice contributed by Prince Kropotkin.

I made Dr. Radde's acquaintance at Tiflis in June, 1868. He and Dr. Abich were then the representatives of science in the Caucasian capital. Caucasia had at that time its own Court and its own administration. Dr. Radde's scientific attainments and their European recognition placed him in the end in such a position that he was selected as the companion of Grand Duke Michael Nicholavich in his yacht voyage to India and Japan, and in 1895 and 1897 he was again selected to accompany members of the Imperial family on a visit to the North African coast-lands.

Time has only strengthened the first impression Dr. Radde made on me as a youth, that of a man with an extraordinarily wide interest and power of observation in various branches of Natural Science. Specialization is no doubt a quality, but it may also be a defect in a traveller. The man who has never made a mistake in life or science has lived and worked in a very narrow groove. Dr. Radde was well fitted to be a pioneer of knowledge in new regions. He was admirably qualified for the receipt of one of the gold medals of the Royal Geographical Society, which was bestowed on him in 1889—nine years before he received the chief medal of the Russian Geographical Society. The formal statement of the grounds of our Society's grant has recently been quoted in Germany as the most complete summary of Dr. Radde's claims, and may, I think, be appropriately repeated here:—

"The Patron's Medal to Dr. G. Radde (Director of the Natural History Museum, Tiflis), for a life devoted to the promotion of Scientific Geography, as a traveller, observer, and author, and particularly for his five years' travels in Eastern Siberia (1855–60), his persistent exploration of the Caucasian chain (1864–5 and 1876–85), Mingrelia, Abkhasia, Karatchai, Daghestan, and of the Armenian Highlands, and the Caspian coast (1875–80), and his services as chief of the Transcaspian Expedition in 1886. Also for the important works in which he has recorded the result of his explorations: (1) 'Reisen in Ost-Siberian, mit Karten,' 1862–4; (2) 'Die drei langen Hochthälern Imeritiens;' (3) 'Vier Vorträge über den Kaukasas,' 1874; (4) 'Aus den Hochalpen des Daghestan,' 1886; (5) 'Die Chewsuren und ihr Land,' 1878; (6) 'Reisen um die Persisch-Russischen Gränzen,' 1885; (7) 'Vorläufiger Bericht über die Expedition nach Manchurien und Khorassan,' 1887. And particularly for the talent with which, while paying special attention to various branches of natural history, especially ethnology, ornithology, and botany, he has kept in view their relations to Geography, and has made it his main object to set out in a clear and comprehensive manner the physical characteristics of the countries he has explored, with their causes and effects (see Nos. 1, 3, and 5). And finally, for the zeal, energy, and artistic intelligence he has exhibited in the arrangement on a Geographical basis of the Natural History Museum at Tiflis."

DOUGLAS W. FRESHFIELD.

Dr. Heinrich Hartl.

Dr. Heinrich Hartl, Colonel of the Reserve, and Professor of Geodesy in the University of Vienna, died in Vienna on April 3, at the age of sixty-three years. Dr. Hartl saw a good deal of active service in the early part of his career, and was known for his services in connection with the determinations of position and the making of route surveys in Turkey for the map of Central Europe on the scale of 1:300,000, and the cadastral survey of Bosnia and Herzegovina. But the great work of his life was the organization of the trigonometrical survey of Greece. When the Greek ministry approached the Austrian Government with a request for assistance, Hartl was appointed leader of the Geodetic Commission, which began

its labours in September, 1889. The work in Greece was, to a great extent, directed from Vienna, Hartl's actual presence in the country being only required during a few months in each year. He was thus able to carry on important work for his own country at the same time. He retired from the service in 1898, and in the following year was elected professor in the University. He is the author of numerous papers on cartographical subjects, most of which are published in the *Mitteilungen des K. u. K. Militärgeographischen Institutes* of Vienna, and in the Reports of the Survey of Greece.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1902-1903.

Tenth Ordinary Meeting, March 23, 1902.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS:—*A. W. H. Anderson; Lieut.-Colonel A. R. Browne, the Border Regiment; Lieut. Edmund Tillotson Rich, R.E.; Frederick H. R. Sawyer, M. Inst. C.E.; Fred. Snowden, C.E.; Harry Houlton Vivian, J.P.*

HONORARY CORRESPONDING MEMBERS.

M. Alfred Grandidier; Prof. Henri Cordier.

MEDALS AND OTHER AWARDS.

The PRESIDENT: I have to announce that the Council has selected as recipient of the Royal Medals Mr. Douglas W. Freshfield, for his work in the Caucasus, and Captain Otto Sverdrup, for his important discoveries in the Arctic Regions. The names have been submitted to the King, and His Majesty has signified his approval. For the minor awards, Major Burdon, who has made a large number of excellent route-maps in Northern Nigeria, will have the Cuthbert Peek Grant; Captain Isachsen, who was with Captain Sverdrup in his recent expedition, and did a great amount of exploring work, and discovered the two large islands north of the Parry group, is to have the Murchison Grant; Mr. Ellsworth Huntingdon, who made a remarkable journey through the great cañon of the Euphrates river during which he made valuable observations in physical geography, takes the Gill Memorial; and Dr. W. G. Smith, for his investigations into the geographical distribution of vegetation in Yorkshire, takes the Back Bequest.

Commemoration of the Tercentenary of the Reign of Queen Elizabeth.

Addresses by the President, Sir Clements Markham, K.C.B., Edmund Gosse, Esq. (Raleigh), Julian Corbett, Esq. (Drake), Prof. Silvanus P. Thompson, F.R.S. (William Gilbert and Terrestrial Magnetism), and others.

There was also an Elizabethan Exhibition of Portraits, Globes, Maps, Atlases, Instruments, Navigation Books, Relics, etc.

Special Meeting in the Map Room, Thursday, April 2, 1903, 4 *p.m.*—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the chair.

Subject:—

"Geographical Education, with Special Reference to his Curved Contoured Maps, Globes, and Reliefs." By Prof. Elisée Reclus.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Geology. *M.K.K.G. Ges. Wien* **45** (1902): 292–298. **Diener.**

Die Stellung der Croatisch-Slavonischen Inselgebirge zu den Alpen und dem Dinarischen Gebirgssystem. Von Prof. Dr. C. Diener.

Austria—Glacial Epoch. *Sitzb. A.W. München* (1902): 459–486. **Günther.**

Glaziale Denudationsgebilde im mittleren Eisacktale. Von S. Günther. *With Illustrations.*

Austria—Watershed. *M.K.K.G. Ges. Wien* **45** (1902): 221–239. **Schönberger.**

Die Umrandung des Marchbeckens. Von F. F. Schönberger.

Denmark. *G. Tidskrift* **16** (1901–1902): 242–250. **Hartz.**

Interglaciale Aflejringer i Danmark og Nordtyskland. Ved N. Hartz.

Europe—Ethnology. *Globus* **83** (1903): 109–110. **Krause.**

Kann Skandinavien das Stammland der Blonden und der Indogermanen sein? Von E. H. L. Krause.

Europe—Geological. *C. Rd.* **136** (1903): 256–258. **Leriche.**

Sur l'existence d'une communication directe entre les Bassins parisien et belge, à l'époque yprésienne. Note de M. Leriche.

Europe—Historical. **Hughes.**

Shakespeare's Europe. Unpublished Chapters of Fynes Moryson's Itinerary. Being a Survey of the Condition of Europe at the end of the Sixteenth Century. With an Introduction and an Account of Fynes Moryson's Career. By Charles Hughes. London: Sherratt & Hughes, 1903. Size 10½ × 7½, pp. l. and 498. *Facsimiles. Price* 15*s.*

Printed from the manuscript in the library of Corpus Christi College, Oxford.

France—Corsica. **Rikli.**

Botanische Reisestudien auf einer Frühlingsfahrt durch Korsika. Von Dr. M. Rikli. Zürich: Fäsi & Beer, 1903. Size 9½ × 6½, pp. xiv. and 140. *Illustrations. Presented by the Publishers.* [To be reviewed.]

France—Quercy. *B.S.G. Com. Bordeaux* **29** (1903): 25–35. **Lestrade.**

Le Quercy. Par P. Lestrade.

The old province of Quercy now forms part of the departments of Lot and Tarn-et-Garonne.

France—Vosges. **Fournier.**
B.S.G. l'Est **21** (1900): 51–65, 205–220, 357–376, 522–542; **22** (1901): 23–44, 167–181, 277–292; **23** (1902): 39–52, 202–218, 293–305.
Les Vallées vosgiennes. Par A. Fournier.

Germany—Weser. *Globus* **83** (1903): 110–113, 124–127. **Behrens.**
Die Weser. Eine hydrographische Darstellung auf Grund des von dem preussischen Wasserausschusse herausgegebenen Weser-Ems-Werkes. Von Dr. Behrens.

Iceland. *G. Tidskrift* **16** (1901–1902): 219–242. **Bruun.**
Sprengisandur og Egnene mellem Hofs- og Vatnajökull. Undersøgelser foretagne i Sommeren 1902 af Kaptajn Daniel Bruun. *With Map and Illustrations.*

Iceland. *G. Tidskrift* **16** (1901–1902): 194–204. **Lund-Larssen.**
Meddelelser om Generalstabens Ekspedition til Island i Sommeren 1900. Ved Kaptajn Lund-Larssen.

Iceland. *M.K.K.G. Ges. Wien* **45** (1902): 240–291. **Pudor.**
Island-Fahrt. Von Dr. H. Pudor.

Iceland—Grimsöe. *G. Tidskrift* **16** (1901–1902): 204–210. **Thoroddsen.**
Et Besøg paa Grimsø. Af Prof. Dr. Th. Thoroddsen. *With Map.*

Italy—Genoa. *Ann. Hydrographie* **31** (1903): 54–58. ——
Plan für Hafenschutzbauten in Genua mit Rücksicht auf die Sturmverhältnisse. *With Plans.*

Italy—Sicily. *B.S.G. Italiana* **3** (1902): 937–941. **Revelli.**
A proposito della recente alluvione nel Modicano. Nota del dott. Paolo Revelli.

Mediterranean. *B.S.G. Italiana* **3** (1902): 941–951. **Marini.**
Densità e temperatura del mare tra Santa Tecla e Capo Molini (Costa orientale della Sicilia). Nota del dott. L. Marini. *With Map and Diagrams.*

Mediterranean. *J.R. United Service I.* **47** (1903): 78–81. **Harkness.**
A Question of an Exchange with Spain in the Mediterranean. By Major T. R. Harkness.
Suggests the exchange of Gibraltar for Port Mahon in Minorca.

Mediterranean—Crete. *C. Rd.* **136** (1903): 330–332. **Cayeux.**
Existence du Jurassique supérieur et de l'Infracrétacé dans l'île de Crète. Note de L. Cayeux.

Mediterranean—Crete. *C. Rd.* **136** (1903): 519–521. **Cayeux.**
Les éruptions d'âge secondaire dans l'île de Crète. Note de L. Cayeux.

Mediterranean—Crete. **Wilkinson.**
Trade of Crete for the year 1901. Foreign Office, Annual No. 2932, 1903. Size 10 × 6½, pp. 10. *Price* 1*d.*

Mediterranean—Cyprus. *Quarterly J.R. Meteorolog. S.* **29** (1903): 29–46. **Bellamy.**
Notes on the Climate of Cyprus. By C. V. Bellamy. *With Map.*

Mediterranean—Geology. *C. Rd.* **136** (1903): 474–476. **Cayeux.**
Phénomènes de charriage dans la Méditerranée orientale. Note de L. Cayeux.

Mont Blanc—Glaciers. *B.S.G. Italiana* **3** (1902): 862–878, 913–937. **Porro.**
Ricerche preliminari sopra i Ghiacciai italiani del Monte Bianco (Campagna del 1897). Nota del Prof. F. Porro.

Montenegro. **Wyon and Prance.**
The Land of the Black Mountain. The Adventures of Two Englishmen in Montenegro. By Reginald Wyon and Gerald Prance. London: Methuen & Co., 1903. Size 8 × 5, pp. xviii. and 300. *Map and Illustrations. Price* 6*s. Presented by the Publishers.*

Russia—Cartography. **Stavenhagen.**
Petermanns M. **48** (1902): 224–229, 254–260, 274–278.
Russlands Kartenwesen in Vergangenheit und Gegenwart. Von Hauptmann W. Stavenhagen.

Russia—Magnetism. **Passalsky.**
P. Passalsky. Anomalies Magnétiques dans la région des mines de Krivoï-Rog. Odessa, 1901. Size 12½ × 10½. *Charts. Price* 4*s.*

ORDNANCE SURVEY MAPS.

THE following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post offices.

10 miles to 1-inch Scale.

	Price per sheet. s.	d.
1.*Great Britain, engraved. Printed from a transfer from copper, with water in blue, latitude and longitude not marked. Size about 20 × 13 inches. On paper	1	0

4 miles to 1-inch Scale.

2. England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper	1	6
3.*England and Wales, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 22½ × 15 inches. On paper	1	6
4. Scotland, engraved. Printed from a transfer from copper, with water in blue, latitude and longitude marked, no hill shading or contours. Size 18 × 12 inches. On paper	1	0
5.*Scotland, engraved. Printed from a transfer from copper, hills in brown, roads sienna, water blue, woods green. Size 18 × 12 inches. On paper	1	0
6.*Ireland, engraved. Printed from a transfer from copper, with water in blue. Size 18 × 12 inches. On paper	1	0
7.*County and District Maps of Great Britain, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. In sheets. Unmounted . . . . . 6*d.* and	1	0
Folded in covers . . . . . 9*d.* and	1	0

2 miles to 1-inch Scale.

8.*England and Wales (part of), engraved. Printed from a transfer from copper, hills and contours in brown, first-class roads burnt sienna, woods green, water blue, latitude and longitude marked. Size 18 × 12 inches. Mounted on linen and folded in cover	1	0

1-inch Scale.

9. England and Wales, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
10.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
11. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
12.*Ditto, hills hachured in brown, contours red, roads sienna, water blue, magnetic variation shown, latitude and longitude not marked. Size 18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1	0
Combined sheets	1	6

---

* Publication in progress.

	Price per sheet. s. d.
13. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1 9
14. Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1 6
15. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
16.*Ditto, outline, not contoured, in black, latitude and longitude marked, showing county, rural, urban, and county borough boundaries in red. Size 18 × 12 inches	1 0
17. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
18.*Ditto, hills hachured in brown, roads sienna, water blue, woods green, latitude and longitude marked. Size 18 × 12 inches. On linen, backed paper, either flat or folded in covers	1 0
19.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted	9*d.* to 1 6
Folded in cover	1*s.* to 1 6

6-Inch Scale.

20 Great Britain, water coloured blue or back lined, contours in black, latitude and longitude marked. Heliozincographed or photozincographed. Size 18 × 12 inches	1 0
Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches	2 6
21. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches	2 6

$\frac{1}{2500}$ Scale.

22. Houses ruled in black, water blue or back lined, latitude and longitude not marked. Size 38 × 25½ inches	3 0
23. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2*s.* 6*d.* to 23*s.*, according to the amount of colouring. This form is gradually being superseded by 20.	

Town Scales.

24. $\frac{1}{528}$ scale, houses stippled. Size 38 × 25½	2 6
25. Ditto, houses ruled. Size 38 × 25½	2 6
26. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2*s.* 6*d.* to 15*s.*, according to the amount of colouring. Applies to unrevised only.	
27. 5-feet scale, houses stippled. Revised. Size 36 × 24 inches	2 6

Index Maps.

28. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches	0 2
29.*Index to the sheets of the 6-inch scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 6
30.*Index to the sheets of the 1 : 2500 scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 6

Nos. 29 and 30 are identical with Nos. 9 and 13, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.

---

* Publication in progress.

Scandinavia. **Lönborg.**

Finnmarkerna i mellersta Skandinavien. Af Sven Lönborg. (Ur *Ymer*, Årg. 1902, H. 1, 3 och 4.) Stockholm, 1903. Size 9½ × 6½, pp. [114]. *Maps and Illustrations. Presented by the Author.*

Scandinavia. *Ymer* **22** (1902): 505–514. **Wilser.**

Hafva folkinvandringar ägt rum i Skandinavien? Af Dr. L. Wilser.

Discusses the question of former immigrations into Scandinavia.

Turkey—Thasos. *B.S.R. Belge G.* **26** (1902): 475–501. **Hauttecœur.**

L'Ile de Thasos. Par H. Hauttecœur. *With Map.*

United Kingdom—England. **Thompson.**

The Canal System of England: Its Growth and Present Condition, with particular reference to the cheap carriage of goods. By H. Gordon Thompson. London: T. Fisher Unwin, [not dated]. Size 7 × 5¼, pp. 70 and iv. *Price* 1*s.* 6*d. Presented by the Publishers.*

United Kingdom—London. **Lethaby.**

London before the Conquest. By W. R. Lethaby. London: Macmillan & Co., Ltd., 1902. Size 8½ × 5½, pp. xii. and 218. *Illustrations. Price* 7*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—London. *Fortnightly Rev.* **72** (1902): 796–805. **Miller.**

Port of London. The coming reform. By F. Miller.

ASIA.

Afghanistan. *G.Z.* **8** (1902): 665–686. **Immanuel.**

Afghanistan. Von Hauptmann Immanuel.

Central Asia. *Meddelanden G. Fören. Finland* **6** (1901–1903): pp. 14. **Brotherus.**

Vegetationsskizzer fran Centralasien. Af V. F. Brotherus. *With Illustrations.*

Central Asia. *Scottish G. Mag.* **19** (1903): 113–141. **Hedin.**

Three Years' Exploration in Central Asia, 1899–1902. By Dr. Sven Hedin.

Central Asia. *G. Tidskrift* **16** (1901–1902): 250–259. **Olufsen.**

Sommeren i Centralasien fra Kaspihavet til Ferghanas Østgrænse. Af O. Olufsen. *With Map.*

Central Asia—Pamirs. **Olufsen.**

The Second Danish Pamir Expedition: Meteorological Observations from Pamir, 1898–99. By O. Olufsen. [Copenhagen]: E. Bojesen, 1903. Size 10½ × 7, pp. 92. *Map and Profiles.*

Central Asia—Tian Shan. *Z. Ges. Erdk. Berlin* (1903): 82–121. **Friederichsen.**

Forschungsreise in den Centralen Tiënschan und Dsungarischen Ala-tau im Jahr 1902. Vorläufiger Bericht von Dr. Max Friederichsen. *With Illustrations.*

China. *J. United Service I. India* **32** (1903): 1–23. **Manifold and Hunter.**

Narrative of part of a Journey from Peking to S'uch'uan. By Lieut.-Colonel C. C. Manifold and Captain C. G. W. Hunter. *With Map.*

China—Manchuria. *Meddelanden G. Fören. Finland* **6** (1901–1903): pp. 15. **Bohnhof.**

Die Mandschurei und die Ussuri-Provinzen. Reiseskizzen von Hugo Bohnhof.

China—Manchuria. *Asien* **2** (1903): 65–66. **Kleist.**

Die wirtschaftlichen Verhältnisse der Mandschurei. Von v. Kleist.

Eastern Asia. *J.S. Arts* **51** (1903): 313–323. **Carey.**

Tonkin, Yunnan, and Burma. By F. W. Carey.

Eastern Asia. **Krahmer.**

Russland in Asien. Band IV. Russland in Ost-Asien (mit besonderer Berücksichtigung der Mandschurei). Von Krahmer. Leipzig: Zuckschwerdt & Co., 1899. Size 9½ × 6½, pp. vi. and 221. *Maps and Plan.*

French Indo-China. *La G., B.S.G. Paris* **7** (1903): 77–90. **Aïtoff.**

L'Œuvre de M. Pavie en Indo-Chine (1879–1895). Par D. Aïtoff. *With Maps.*

India. **Ferguson.**

Six Weeks' Trip through India: being Notes by the Way. By J. Ferguson. Colombo: A. M. & J. Ferguson, 1902. Size 7½ × 4½, pp. 156. *Map. Presented by the Author.*

India. **Lilly.**

India and its Problems. By William Samuel Lilly. London: Sands & Co., 1902. Size 9 × 5½, pp. xx. and 324. *Map. Price 7s. 6d.*

India—Himalayas. *Alpine J.* **21** (1903): 304–311. **Neve.**

A First Exploration of Nun Kun. By Arthur Neve. *With Map and Illustrations.*

The Nun Kun are lofty twin peaks west of Zanskar.

India—Kumaon. *Mem. Geolog. Surv. India* **32** (1902): 127–184. **Krafft.**

Notes on the "Exotic Blocks" of Malla Johar in the Bhot Mahals of Kumaon. By A. von Krafft, PH.D. *With Map and Plates.*

India—Mica. *Mem. Geolog. Surv. India* **34** (1902): 11–122. **Holland.**

The Mica Deposits of India. By T. H. Holland. *With Maps and Plates.*

Indian Ocean—Andamans and Nicobars. **Kloss.**

In the Andamans and Nicobars. The Narrative of a cruise in the schooner *Terrapin*, with notices of the Islands, their Fauna, Ethnology, etc. By C. Boden Kloss. London: John Murray, 1903. Size 9½ × 6½, pp. xvi. and 374. *Illustrations. Price 21s. net. Presented by the Publishers.* [See review, *ante*, p. 537.]

India—Rajputana. *Mem. Geolog. Surv. India* **35** (1902): 1–116. **La Touche.**

Geology of Western Rajputana. By T. D. La Touche. *With Map and Plates.*

Malay Archipelago—Celebes. **Veenhuijzen.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **20** (1903): 35–66.

Aanteekeningen omtrent Bolaäng-Mongondo, ontleend aan het verslag over eene reis van 7 April tot en met 20 Mei 1900, tot onderzoek naar de gemeenschappelijke grenzen van de Minahassa en het landschap Bolaäng Mongondo. Door A. C. Veenhuijzen. *With Map.*

Noticed in the Monthly Record for March (*ante*, p. 318).

Malay States—Railways. *P.I. Civil Engineers* **150** (1902): 325–339. **Hanson.**

Federated Malay States Railways, Perak and Province Wellesley. By C. R. Hanson. *With Plans and Sections.*

Pamirs. **Filchner.**

Ein Ritt über den Pamir von Wilhelm Filchner. Berlin: E. S. Mittler u. Sohn, 1903. Size 10½ × 7, pp. x. and 238. *Maps and Illustrations. Price 8s. 6d.*

Russia—Siberia. *La G., B.S.G. Paris* **6** (1902): 252–254. **Labbé.**

La prise et la débâcle des rivières de Sibérie en 1901. Par P. Labbé.

Russia—Transcaucasia. *Naturw. Wochenschrift* **2** (1903): 195–199. **Rossmässler.**

Die Halbinsel Apscheron. Von F. Rossmässler.

Russian Central Asia. *M.G. Ges. Hamburg* **18** (1902): 200–267. **Friederichsen.**

Reisebriefe aus Russisch Central-Asien. Von Dr. Max Friederichsen.

Russian Central Asia. **Lipsky.**

Upper Bukhara, Results of three years' travels in Central Asia in 1896, 1897, and 1899. V. I. Lipsky. Part ii. [In Russian.] St. Petersburg, 1902. Size 11½ × 9, pp. 319–541. *Illustrations.*

Turkey—Asia Minor. *Petermanns M.* **48** (1902): 270–274. **Schaffer.**

Zur Geotektonik des südöstlichen Anatolien. Von Dr. F. Schaffer. II. Studien auf einer Reise im Sommer 1901.

Turkey—Euphrates. *B. American G.S.* **34** (1902): 301–310, 384–393. **Huntington.**

The Valley of the Upper Euphrates and its People. By E. Huntington. *With Maps and Illustrations.*

An account of Mr. Huntington's journey appeared in the *Journal* for August, 1902 (vol. xx. p. 175).

Turkey—Jeddah and Hodeida. **Devey.**

Trade of the Eastern Coast of the Red Sea for the years 1899–1901. Foreign Office, Annual No. 2926, 1903. Size 10 × 6, pp. 26. *Price 2d.*

AFRICA.

British East Africa and Sudan. **Buxton.**

Two African Trips, with notes and suggestions on big game preservation in Africa. By Edward North Buxton. London: E. Stanford, 1902. Size 10 × 7, pp. xiv. and 210. *Map and Illustrations. Presented by the Author.*

Cape Colony. *P.I. Civil Engineers* **150** (1902): 376–397. **Braine.**

Reclamation of Drift-Sands in Cape Colony. By C. D. H. Braine. *With Map.*

Central Africa. *B.S.G. l'Est* **23** (1902): 5–38, 145–179. **Lemaire.**

Note sur la ligne de faîte Congo-Zambèze (mission scientifique du Ka-Tanga). Par C. Lemaire.

Congo. **Mees.**

Une Expédition Portugaise au Congo en 1512. Par Jules Mees. Bruxelles: P. Weissenbruch, 1902. Size 9 × 6, pp. 10.

Congo State. **Burrows and Canisius.**

The Curse of Central Africa, by Captain Guy Burrows, with which is incorporated, A Campaign amongst Cannibals, by Edgar Canisius. London: R. A. Everett & Co., Ltd., 1903. Size 10 × 6, pp. xxxviii., 276, and xvi. *Map and Illustrations. Price* 21*s. net. Presented by the Publishers.*

East Africa. *La G., B.S.G. Paris* **7** (1903): 91–112. **Bozas.**

D'Addis-Abbabá au Nil par le lac Rodolphe. Par Vicomte du Bourg de Bozas. *With Map.*

See note in the Monthly Record for March.

East Africa. *La G., B.S.G. Paris* **7** (1903): 132–134. **Chesneau.**

Les frontières de l'Éthiopie et de l'Érythrée. Par M. Chesneau. *With Map.*

East Africa. *B.S.G. Italiana* **8** (1902): 1004–1012. ——

Ulteriori note illustrative sulla seconda Spedizione Bòttego. *With Illustrations.*

Egypt—Geology. *Sitzb. A.W. München* (1902): 353–433. **Blanckenhorn.**

Neue geologisch-stratigraphische Beobachtungen in Ægypten. Von Max Blanckenhorn.

Egypt—Sudan. *J. African S.* **2** (1903): 121–131. **Stanton.**

The Peoples of the Anglo-Egyptian Sudan. By Lieut.-Colonel E. A. E. Stanton. *With Map and Illustrations.*

Egypt—Sudan. ——

Addenda and Corrigenda for 1902–1903 to the Notes for Travellers and Sportsmen in the Sudan. Cairo. Size 11 × 8, pp. 12.

Eritrea. *B.S.G. Italiana* **3** (1902): 987–1003. **Marini.**

La valle del Gherghèr (Colonia Eritrea). Nota del A. Marini. *With Maps and Illustrations.*

French Congo. *Mouvement G.* **20** (1903): 127–131. **Vasseur.**

La Likuala-aux-herbes, exploration nouvelle. Par M. Vasseur. *With Map.*

German East Africa. *Meteorolog. Z.* **19** (1902): 543–548. **Maurer.**

Das Klima von Deutsch-Ostafrika. Von H. Maurer.

German South-West Africa. **Dove.**

Deutsch-Südwest-Afrika. Von Prof. Dr. Karl Dove. Berlin: Wilhelm Süsserott, 1903. Size 8½ × 5½, pp. 208. *Map and Illustrations. Price* 4*s.*

Italian East Africa. **Ferrandi.**

Ugo Ferrandi. Itinerari Africani, I° Da Lugh alla Costa (Aprile 1897). Novara, 1902. Size 10 × 7, pp. 62. *Map. Presented by the Author.*

This was noticed in the *Journal* for February (p. 168).

Ivory Coast. **Villamur.**

Renseignements Colon., Comité l'Afrique Française No. I. (1903): 22–29.

La Côte d'Ivoire: aspect général, flore et faune. Par R. Villamur.

Madagascar. *La G., B.S.G. Paris* **6** (1902): 238–242. **Grandidier.**

Madagascar, essai de géographie physique. Par G. Grandidier.

Morocco. **Segonzac.**

M^is de Segonzac. Voyages au Maroc (1899–1901). Avec . . . Appendices politique, astronomique, météorologique, botanique, entomologique, numismatique, géographique. Par MM. de Vanssay, Hasse et de Villedeuil, etc., etc. Paris: Armand Colin, 1903. Size 11 × 7½, pp. xi. and 408. *Maps and Illustrations. Price 20 fr. Presented by the Publisher.*

Morocco. *M.G. Ges. Hamburg* **18** (1902): 1–199. **Fischer.**

Meine dritte Forschungsreise im Atlas-Vorlande von Marokko im Jahre 1901. Von Theobald Fischer. *With Map and Illustrations.*

Nigeria. **Carnegie.**

Letters from Nigeria of the Honourable David Wynford Carnegie, F.R.G.S. 1899–1900. With Introduction and Appendix. Privately Printed. Brechin: Black & Johnston, 1902. Size 9 × 5, pp. xlii. and 150. *Portraits. Presented by Miss Helena M. Carnegie.*

Nigeria. **Lugard.**

Northern Nigeria. Report for 1901. Colonial Reports, Annual No. 377, 1903. Size 10 × 6½, pp. 36. *Price* 2½*d.*

See note in the March number (*ante*, p. 322).

Nile. *Quarterly J. Geolog. S.* **59** (1903): 64–79. **Ball.**

The Semna Cataract or Rapid of the Nile: a Study in River-Erosion. By John Ball, PH.D. *With Map and Illustrations.*

North-East Africa. ——

Renseignements Colon., Comité l'Afrique Française No. 1 (1903): 13–20.

La délimitation de l'Afrique orientale. *With Maps.*

Rhodesia. *P.R. Irish A.* **24** (Sec. C) (1902): 47–54. **Lane-Poole.**

An Arabic Inscription from Rhodesia. By S. Lane-Poole. *With Plate.*

Sahara. *B.S.G. Marseille* **26** (1902): 297–301. **Lahache.**

Hydrographie Saharienne. Les eaux du Tidikelt. Par Dr. Lahache.

Somaliland. *Scottish G. Mag.* **19** (1903): 95–96. ——

Somaliland. *With Map.*

South Africa—Elephants. *Fortnightly Rev.* **73** (1903): 100–108. **Bryden.**

The Decline and Fall of the South African Elephant. By H. A. Bryden.

South Africa—Farming. *Fortnightly Rev.* **73** (1903): 134–146. **Greswell.**

South African Farming. By Rev. W. Greswell.

Transvaal. ——

Transvaal Mines Department. Yearly Report of the Government Mining Engineer for the Statistical Year ending June 30, 1902. Printed at Pretoria. Size 13½ × 8½, pp. 42. *Maps and Diagrams. Presented by the Government Mining Engineer, Johannesburg.*

Tunis. **Bedel.**

Exploration Scientifique de la Tunisie. Catalogue raisonné des Coléoptères de Tunisie par Louis Bedel, comprenant tous les documents déjà publiés ou obligeamment communiqués et spécialement le résultat des voyages de MM. Valéry Mayet et Maurice Sedillot. Première partie. Cicindelidæ—Staphylinidæ. Paris: Imp. Nationale, 1900. Size 10 × 6½, pp. xiv. and 130. *Presented by Messrs. Leroux & Co.*

Tunis. *Ann. G.* **11** (1902): 439–447. **Idoux.**

Notes zur le Nefzaoua (Tunisie méridionale). Par M. Idoux.

NORTH AMERICA.

Alaska. **Brooks, Richardson, Collier, and Mendenhall.**

Reconnaissances in the Cape Nome and Norton Bay Regions, Alaska, in 1900. By A. H. Brooks, G. B. Richardson, A. J. Collier, and W. C. Mendenhall. (Department of the Interior, United States Geological Survey.) Washington, 1901. Size 11½ × 8, pp. 222. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

Alaska—Coal-Fields. **Kirsopp.**

The Coal-Fields of Cook Inlet, Alaska, U.S.A., and the Pacific Coast. A paper

read before the Institution of Mining Engineers. By John Kirsopp, jun. General meeting at London, May 24, 1901. London and Newcastle-upon-Tyne: A. Reid & Co., 1901. Size 10 × 6½, pp. 54. *Maps and Plans. Presented by the Author.*

Alaska—Copper River District. **Schrader and Spencer.**

The Geology and Mineral Resources of a portion of the Copper River District, Alaska. By F. C. Schrader and A. C. Spencer. (Department of the Interior, United States Geological Survey.) Washington, 1901. Size 12 × 8, pp. 94. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

Mexico. **Lumholtz.**

Unknown Mexico. A Record of five years' exploration among the tribes of the Western Sierra Madre; in the Tierra Caliente of Tepic and Jalisco; and among the Tarascos of Michoacan. By Carl Lumholtz. Two Volumes. London: Macmillan & Co., Ltd., 1903. Size 9½ × 6½, pp. (vol. i.) xxxii. and 530; (vol. ii.) xv. and 496. *Maps and Illustrations. Price* 50*s.*, *net. Presented by the Publishers.*

See review, *ante*, p. 543.

United States—Appalachian Mountains. **Machaček.**

Vierteljahrs. G. Unterricht **2** (1903): 61–75.

Die Appalachien. Von Dr. F. Machaček.

An excellent summary of the results of recent research.

United States—Coal Industry. **Bell.**

Coal Industry of the United States, 1901. Foreign Office, Miscellaneous, No. 587, 1903. Size 10 × 6½, pp. 32. *Price* 2*d.*

United States—Coast and Geodetic Survey. **Tittmann.**

National G. Mag. **14** (1903): 1–9.

The Work of the U.S. Coast and Geodetic Survey. By O. H. Tittmann.

United States—Forests. ———

Twenty-first Annual Report of the United States Geological Survey to the Secretary of the Interior. 1899–1900. Part v. Forest Reserves, pp. 712 (Maps separate). Washington, 1900. Size 11½ × 8. *Maps and Illustrations. Presented by the U.S. Geological Survey.*

United States—Historical. **Fowler and Coues.**

The Journal of Jacob Fowler narrating an adventure from Arkansas through the Indian Territory, Oklahama, Kansas, Colorado, and New Mexico, to the Sources of the Rio Grande del Norte, 1821–22. Edited, with notes, by Elliott Coues. New York, etc.: Francis P. Harper, 1899. Size 9½ × 6½, pp. xxiv. and 184. *Facsimile.*

United States—Historical. **Garces and Coues.**

On the Trail of a Spanish Pioneer. The Diary and Itinerary of Francisco Garcés (Missionary Priest) in his Travels through Sonora, Arizona, and California, 1775–1776. Translated from an Official Contemporaneous Copy of the Original Spanish Manuscript, and edited, with copious critical notes, by Elliott Coues. Two volumes. New York: Francis P. Harper, 1900. Size 9½ × 6½, pp. xxx. and 608. *Maps and Illustrations.*

United States—Historical. **Larpenteur and Coues.**

Forty Years a Fur Trader on the Upper Missouri. The Personal Narrative of Charles Larpenteur, 1833–1872. Edited, with many critical notes, by Elliott Coues. Two Volumes. New York: Francis P. Harper, 1899. Size 9½ × 6½, pp. xxviii. and 474. *Maps, Portraits, and Illustrations.*

United States—Historical. **Lewis and Clark and Hosmer.**

History of the Expedition of Captain Lewis and Clark, 1804–5–6. Reprinted from the Edition of 1814. With Introduction and Index by James K. Hosmer. In two volumes. Chicago: A. C. McClurg & Co., 1902. Size 8½ × 6, pp. (vol. i.) lvi. and 500; (vol. ii.) xiv. and 584. *Maps and Portraits.*

In view of the rarity of the original edition of 1814, and the fact that Prof. Elliott Coues' reprint of 1893 is also out of print, the present publishers have done good service in bringing out a handy version of this important work for popular use. The addition of an index is also valuable.

United States—Jews. *Popular Sci. Monthly* **62** (1903): 334–343. **Mitchell.**

Recent Jewish Immigration to the United States. By R. Mitchell.

United States—Pennsylvania. *J. Geology* **10** (1902): 700–702. **Richardson.**

The Misnamed Indiana Anticline. By G. B. Richardson. *With Map.*

United States—Texas. **Hill.**

Twenty-first Annual Report of the United States Geological Survey to the Secretary of the Interior. 1899–1900. Part vii. Geography and Geology of the Black and Grand Prairies, Texas, with detailed descriptions of the Cretaceous Formations and special reference to Artesian Waters. By Robert T. Hill. Pp. 666. Washington, 1901. Size 11½ × 8. *Maps and Illustrations.*

United States—Virginia. **Hariot and Stevens.**

A Briefe and True Report of the new-found land of Virginia, Sir Walter Raleigh's Colony of MDLXXXV., by Thomas Hariot, Mathematician. Edited by Henry Stevens. London: Privately printed, 1900. Size 6½ × 4½, pp. xviii. and 84. *Price* 15*s.*

Reprinted from the copy in the Grenville Library in the British Museum, one of the seven copies of the original work now known to exist. It appeared in 1588, and was reprinted by De Bry in 1590.

CENTRAL AND SOUTH AMERICA.

Argentine Republic. **Chavanne.**

Die Temperatur- und Regenverhältnisse Argentiniens. Von Dr. Josef Chavanne. (Veröffentlichungen der Deutschen Akademischen Vereinigung zu Buenos Aires. I. Band VII. Heft.) Buenos Aires, [not dated.] Size 9 × 6½, pp. 40. *Maps.*

Bolivia—Census.

Censo de la Población de Bolivia, Septiembre 1° de 1900. Tomo i. La Paz, 1902. Size 10½ × 7½, pp. 30, xliv., and 400. *Presented by the Oficina Nacional de Inmigracion, etc., La Paz.*

Chile. *G.Z.* **8** (1902): 686–692. **Hettner.**

Die Deutschen in Süd-Chile. Von Alfred Hettner.

Chile—Bibliography. **Anrique and Silva.**

Ensayo de una Bibliografía Histórica i geográfica de Chile. Por Nicolas Anrique R. i L. Ignacio Silva, A. Santiago de Chile, 1902. Size 9½ × 7, pp. xx. and 680. *Presented by the Author.*

Chile and Argentina. **Vicuña.**

El laudo arbitral. Por S. M. Vicuña. Santiago, 1902. Size 10½ × 7, pp. 28.

Ecuador—Galapagos Islands. **Robinson.**

P. American A. Arts and Sci. **38** (1902): 77–270.

Contributions from the Grey Herbarium of Harvard University. N.S. No. xxiv. (Papers from the Hopkins-Stanford Expedition to the Galapagos Islands.) Flora of the Galapagos Islands. By B. L. Robinson. *With Plates.*

Falkland Islands. *Ymer* **22** (1902): 515–528. **Andersson.**

Antarctic expeditionens arbeten på Falklandsöarne och Eldslandet 1902. Rapport från Svenska Sydpolarexpeditionen. Af J. G. Anderson. *With Illustrations.*

Guatemala. *Z. Ges. Erdk. Berlin* (1903): 50. **Sapper.**

Ueber den Ausbruch des Santa Maria. Von Prof. Dr. K. Sapper.

Haiti and Venezuela. *Globus* **83** (1903): 69–72, 85–92. **Schott.**

Beobachtungen und Studien in den Revolutionsgebieten von Domingo, Haiti und Venezuela während einer im Frühjahr 1902 unternommenen Reise. Von Dr. G. Schott. *With Illustrations.*

Peru. *Globus* **83** (1903): 73–76. **Sievers.**

Das Gebiet zwischen dem Ucayali und dem Pachitea-Pichis (Ostperú). Nach den Reisen des Padre Fr. Gabriel Sala dargestellt von Prof. W. Sievers.

Porto Rico. *B. American G.S.* **34** (1902): 401–409. **Alexander.**

Porto Rico: its Climate and Resources. By W. A. Alexander. *With Diagram.*

South America. *La G., B.S.G. Paris* **6** (1902): 75–78. **Nordenskiöld.**

Explorations dans les régions frontières entre la république Argentine et la Bolivie. Par E. Nordenskiöld.

Venezuela—Caracas. **Rivera.**

An Illustrated Guide to Caracas. [By Arturo Rivera.] 1897. Size 8 × 10½, pp. 97. *Illustrations. Presented by the Philadelphia Commercial Museums.*

West Indies—Eruptions. *Petermanns M.* **48** (1902): 286–288. **Supan.**

Der neue Eruptionstypus der Antillen. Von A. Supan.

West Indies—Martinique. *La G., B.S.G. Paris* **6** (1902): 133–141. **Berté.**
Les éruptions de la Montagne Pelée. Récit et observations d'un témoin. Par Dr. E. Berté. *With Map.*

West Indies—Martinique. *C. Rd.* **135** (1902): 1377–1379. **Giraud.**
Sur l'âge des formations volcaniques anciennes de la Martinique. Note de J. Giraud.

West Indies—Martinique. *C. Rd.* **135** (1902): 1301–1307. **Lacroix.**
Nouvelles observations sur les éruptions volcaniques de la Martinique. Par M. Lacroix.

West Indies—St. Vincent. *Sitzb. K.P.A.W. Berlin* (1902) (xli.): 993–994. **Klein.**
Ueber die am 7. Mai 1902 vom Vulcan Soufrière auf St. Vincent ausgeworfene vulcanische Asche. Von C. Klein.

West Indies—Windward Islands. *T. Canadian I.* **7** (1902): 351–370. **Spencer.**
The Windward Islands of the West Indies. By J. W. Spencer. *With Maps and Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *G. Teacher* **2** (1903): 1–9. **Cockburn.**
The Australian Commonwealth. By the Hon. Sir J. Cockburn, K.C.M.G.

Central Australia. **Newland.**
Land-Grant Railway across Central Australia. The Northern Territory of the State of South Australia as a Field for Enterprise and Capital. Boundless Resources: Pastoral, Agricultural, Mineral, Natural Harbours, Navigable Rivers. Compiled and edited by Simpson Newland. Adelaide, 1902. Size 13½ × 8½, pp. 120. *Maps and Illustrations.*

New Zealand. [**Blackburne.**]
New Zealand Nautical Almanac and Tide-Tables, 1903; also Azimuth Tables, and information, with plans, about fifteen of the principal ports of New Zealand. Wellington, N.Z., 1902. Size 9½ × 6, pp. viii. and 230. *Plans. Presented by the Editor* [Captain H. S. Blackburne].

Pacific—Midway Island. *Ann. Hydrographie* **31** (1903): 17–21. ———
Die Midway-Inseln im nördlichen Stillen Ozean.

Samoa. *Globus* **83** (1903): 108–109. **Bülow.**
Der vulkanische Ausbruch auf der Insel Savaii (Deutsch-Samoa). Beobachtet von W. v. Bülow.

POLAR REGIONS.

Antarctic—Belgian Expedition. **Lecointe and others.**
Expédition Antarctique Belge. Résultats du Voyage du S.Y. *Belgica* en 1897–1898–1899 sous le commandement de A. de Gerlache de Gomery. Rapports Scientifiques, publiés aux frais du Gouvernement Belge sous la direction de la Commission de la *Belgica*. Astronomie: Étude des Chronomètres, 1ère p^tie, Méthodes et Conclusions, par G. Lecointe (pp. 62). Ditto. Astronomie, 2ème p^tie, Journaux et Calculs, par G. Lecointe (pp. 130). Ditto. Botanique: Mousses et Coup d'Œil sur la Flore bryologique des Terres Magellaniques, par J. Cardot. Hépatiques, par F. Stephani (pp. 48 and 6). Ditto. Météorologie: Phénomènes Optiques de l'Atmosphère, Journal des Observations de Météorologie Optique faites à bord de la *Belgica*, par H. Arctowski (pp. 48). Ditto. Océanographie: Détermination de la Densité de l'eau de mer, par J. Thoulet (pp. 24). Ditto. Zoologie: Brachiopodes, par L. Joubin (pp. 12). Ditto. Zoologie: Échinides et Ophiures, par R. Kœhler (pp. 42). Ditto. Zoologie: Seals, by G. E. H. Barrett-Hamilton (pp. 20). Ditto. Zoologie: Spongiaires, par E. Topsent (pp. 54). Anvers: Imp. J. E. Buschmann, 1901–1902. *Plates. Presented by the "Belgica" Commission.*

MATHEMATICAL GEOGRAPHY.

Nautical Almanac. ———
The Nautical Almanac and Astronomical Ephemeris for the year 1906, for the meridian of the Royal Observatory at Greenwich. Edinburgh, [not dated]. Size

9½ × 6, pp. xiv., 638, and 18. *Price* 2*s.* 6*d.* *Presented by the Nautical Almanac Office.*

Ditto. Part i. (Containing such portions as are essential for Navigation). Edinburgh, [not dated]. Size 9½ × 6, pp. xiv. and 310. *Price* 1*s.* *Presented by the Nautical Almanac Office.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geology. **Lapparent.**

Abrégé de Géologie. Par A. de Lapparent. Cinquième Édition. Paris: Masson et Cie., 1903. Size 7½ × 4½. *Illustrations.* *Presented by the Author.*

Ground-water. *Meteorolog. Z.* **19** (1902): 537–543. **Liznar.**

Ueber die Aenderungen des Grundwasserstandes nach den vom Prälaten Gregor Mendel in den Jahren 1865–1880 in Brünn ausgeführten Messungen. Von J. Liznar.

Hydrology. *Abh. K.K.G. Ges. Wien* **4** (1902): No. 5, pp. 52. **Fischer.**

Meer- und Binnengewässer in Wechselwirkung. Ein Beitrag zur Subterranen Hydrographie der Karstländer. Von Dr. F. J. Fischer.

Ice-action. *T. Nova Scotian J. Sci.* **10** (1900–1901): 333–344. **Prest.**

On Drift Ice as an Eroding and Transporting Agent. By W. H. Prest.

Limnology. *Abh. K.K.G. Ges. Wien* **4** (1902): No. 6, pp. 14. **Ule.**

Die Aufgabe geographischer Forschung an Seen. Von Prof. Dr. Willi Ule.

Magnetism. **Gilbert.**

William Gilbert of Colchester, Physician of London. On the magnet, magnetick bodies also, and on the great magnet of the Earth; a new Physiology, demonstrated by many arguments and experiments. [Translation, published by the Gilbert Club.] London, 1900. Size 12 × 8, pp. xvii. and 246. *Illustrations.* *Price* 40*s.*

Notes on the De Magnete of Dr. William Gilbert. Privately printed. London, 1901. *Presented by Prof. Silvanus P. Thompson.*

Meteorology—Rainfall. **Hegyfoky.**

Math. Naturw. Berichte Ungarn **17**, 1899 (1901): 113–126.

Die Vertheilung des Niederschlages nach Tageszeiten. Von J. Hegyfoky.

Meteorology—Snow. **Jansson and Westman.**

B. Geol. J. University Upsala **5** (1901): 234–260.

Quelques recherches sur la couverture de neige. Par M. Jansson et J. Westman.

Oceanography. *G.Z.* **9** (1903): 40–48. **Messerschmitt.**

Die wichtigsten geographischen Ergebnisse der deutschen Tiefsee-Expedition. Von Dr. J. B. Messerschmitt.

Oceanography. *Nature* **67** (1903): 246–247. **Thompson.**

The Hydrographical Work of the North Sea Investigation Committee (Scotland). By Prof. D'Arcy W. Thompson.

Oceanography. **Chun.**

Aus den Tiefen des Weltmeeres, von Carl Chun. Schilderungen von der Deutschen Tiefsee-Expedition. Zweite umgearbeitete und stark vermehrte Auflage. Jena: G. Fischer, 1903. Size 11½ × 8, pp. x. and 592. *Map, Plates, and Illustrations.* *Price* 20*s.*

This edition has been enlarged by the incorporation of scientific material, especially in regard to the deep-sea fauna, and by the addition of many new illustrations of the scenery, etc., of the countries visited, especially Kerguelenland.

Oceanography—Baltic. **Cleve and Pettersson.**

Svensk. Hydrog. Biolog. Kom. Skrifter **1** (1903): pp. 15.

Hydrographic-biological Researches by the Swedish Commission in the Skagerack and Baltic. By P. F. Cleve and O. Pettersson. *With Charts and Diagrams.*

Oceanography—Baltic. *La G., B.S.G. Paris* **7** (1903): 120–122. **Rabot.**

Exploration zoologique dans les fosses de la Baltique. Par C. Rabot. *With Map.*

Physics. **Arrhenius.**

Lehrbuch der kosmischen Physik von Dr. Svante August Arrhenius. 2 vols.

Leipzig: S. Hirzel, 1903. Size 9½ × 6, pp. xvi. and 1026. *Diagrams. Price* £1 18*s.*

Phytogeography. **Bretzl.**

Botanische Forschungen des Alexanderzuges. Von Dr. Hugo Bretzl. Leipzig: B. G. Teubner, 1903. Size 9½ × 6, pp. xii. and 412. *Price* 12*m. Presented by the Publishers.*

Phytogeography. **Elliot.**

Nature Studies. (Plant Life.) By G. F. Scott Elliot. London: Blackie & Son, 1903. Size 7½ × 5, pp. viii. and 352. *Illustrations. Presented by the Publishers.*

An excellent feature in this little work is the attention given to the life-conditions of plants in their varying environments.

River-temperatures. *Symons's Meteorolog. Mag.* **38** (1903): 4–6. ——

The Temperature of Air and Rivers.

River Valleys. *Geolog. Mag.* **10** (1903): 70–72. **Hill.**

The Permanence of River Valleys. By the Rev. E. Hill.

Seismology. *B.S.G. Lisboa* **20** (1902): 158–166. **Choffat.**

L'éruption de la Martinique et les tremblements de terre en Portugal. Por P. Choffat.

Soils. *Popular Sci. Monthly* **62** (1903): 436–440. **Zon.**

The Source of Nitrogen in Forest Soil. By R. G. Zon.

Terrestrial Magnetism. **Bauer.**

Treasury Department, U.S. Coast and Geodetic Survey. United States Magnetic Declination Tables and Isogonic Charts for 1902, and Principal Facts relating to the Earth's Magnetism. By L. A. Bauer. Washington, 1902. Size 11½ × 8, pp. 406. *Maps and Illustrations.*

Volcanoes. *Deutsch. Rundschau G.* **25** (1903): 145–161. **Grooss.**

Zur Theorie des Vulkanismus. Von A. Grooss. *With Illustrations.*

Zoogeography. *P. American Philosoph. S.* **41** (1902): 267–400. **Ortmann.**

The Geographical Distribution of Freshwater Decapods and its Bearing upon Ancient Geography. By Dr. A. E. Ortmann. *With Maps.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography—Deserts. *B. American G.S.* **34** (1902): 412–422. **Dodge.**

Life amid Desert Conditions. By R. E. Dodge.

Cable-routes. **Bright.**

Imperial Telegraphic Communication and the "All-British" Pacific Cable. By Charles Bright. (The London Chamber of Commerce. Pamphlet Series, No. 40.) Size 8½ × 5½, pp. 32. *Presented by the Author.*

Colonization. *Mém. Couronnes A.R. Belgique* **60** (1902): pp. 864. **Thozée.**

Théories de la colonisation au XIX^e^ siècle et rôle de l'État dans le développement des colonies. Par Ch. Pety de Thozée et R. Pety de Thozée.

Commercial—Cotton. **Oppel.**

Die Baumwolle nach Geschichte, Anbau, Verarbeitung und Handel, sowie nach ihrer Stellung im Volksleben und in der Staatswirtschaft. Im Auftrage und mit Unterstützung der Bremer Baumwollbörse bearbeitet und herausgegeben von Prof. Dr. A. Oppel. Leipzig, 1902. Size 10 × 7, pp. xvi. and 746. *Price* 18*s.*

Commercial—Jade. *National G. Mag.* **14** (1903): 9–17. **Easter.**

Jade. By S. E. Easter. *With Maps.*

Ethnology. **Frobenius.**

Völkerkunde in Charakterbildern des Lebens, Treibens und Denkens der Wilden und der reiferen Menschheit Von Leo Frobenius. I. Band. Aus den Flegeljahren der Menschheit. II. Band. Die reifere Menschheit. Hannover: G. Jänecke, 1902. Size 8½ × 5½, pp. xii., 416, and 464. *Illustrations. Price* 15*s.*

Ethnology—Germans and Slaves. **Lefèvre.**

Germains et Slaves: origines et croyances. Par André Lefèvre. Paris: C. Reinwald, 1903. Size 7 × 5, pp. 320. *Maps and Illustrations. Price* 3*s.*

Deals largely with mythology and allied subjects, but the sections concerned with

the past history and movements of the races are of interest from the point of view of historical geography.

Historical. *Ann. G.* **11** (1902): 448–451. **Gallois.**

La lettre de Toscanelli à Christophe Colomb. Par L. Gallois.

Historical—Columbus. **Alba.**

Nuevos Autógrafos de Cristóbal Colón y Relaciones de Ultramar. Los publica La Duquesa de Berwick y de Alba. Madrid, 1902. Size 11½ × 8, pp. 294. *Presented by La Duquesa de Alba.*

The former collection of documents, published in 1892, has also been presented to the Society, as well as the catalogue of the collections at the Liria palace, printed in 1898.

Historical—Travel. ——

An English Garner. Voyages and Travel mainly during the Sixteenth and Seventeenth Centuries. With an Introduction by C. Raymond Beazley. Two vols. Westminster: A. Constable & Co., 1903. Size 9 × 5¾, pp. (vol. i.) xxviii. and 332; (vol. ii.) xxiv. and 444. *Price 4s. per volume. Presented by the Publishers.*

BIOGRAPHY.

Boggiani. *B.S.G. Italiana* **3** (1902): 1039–1047. **Giglioli.**

Guido Boggiani. Cenno necrologico del E. H. Giglioli. *With Portrait.*

Boggiani was lately assassinated by the Indians of the Chaco.

Hariot. **Stevens.**

Thomas Hariot, the Mathematician, the Philosopher, and the Scholar; developed chiefly from dormant materials, with notices of his Associates, including biographical and bibliographical disquisitions upon the materials of the history of "Ould Virginia." By Henry Stevens. London: Privately printed, 1900. Size 6½ × 4½, pp. 214. *Price* 15*s.*

Hooker. **Hooker.**

A Sketch of the Life and Labours of Sir William Jackson Hooker. By Sir J. D. Hooker. (Annals of Botany, vol. xvi. No. lxiv., December, 1902.) Size 10 × 7, pp. ix.–xc. *Portrait. Presented by the Author.*

Keppler. **Müller.**

Johann Keppler, der Gesetzgeber der neueren Astronomie. Ein Lebensbild, von Adolf Müller, S.J. Freiburg im Breisgau: B. Herder, 1903. Size 9½ × 6, pp. viii and 186. *Presented by the Publisher.*

Leonardo da Vinci. **Baratta.**

Biblioteca Vinciana—N. I. Mario Baratta. Leonardo da Vinci ed i Problemi della Terra. Torino. Fratelli Bocca, 1903. Size 9½ × 6½, pp. xiv. and 318. *Price* 12*s.* 6*d. net.*

GENERAL.

Altitude and Respiration. *C. Rd.* **136** (1903): 118–120. **Tissot.**

Recherches sur l'influence des variations d'altitude sur les échanges respiratoires. Note de J. Tissot.

Dutch Colonies. **Zimmermann.**

Die Europäischen Kolonien. Fünfter Band. Die Kolonialpolitik der Niederländer. Von Dr. A. Zimmermann. Berlin: E. S. Mittler und Sohn, 1903. Size 9 × 6, pp. xiv. and 304. *Map.*

This is one of the most useful volumes of the series, as the story of Dutch colonial undertakings is perhaps less generally known in its details than those of the other great colonizing powers.

French Colonies. **Dubois and Guy.**

Album Géographique par Marcel Dubois et Camille Guy. IV. Les Colonies françaises. Paris: Armand Colin, 1903. Size 11 × 9, pp. xx. and 244. *Illustrations. Price* 18 *fr.*

This is the fourth volume of the well-known series of geographical pictures by MM. Dubois and Guy, and gives an excellent idea of the conditions of nature and human life in the French colonies.

German Colonies.

Kolonial-Handels-Adressbuch 1903 (7. Jahrgang). Herausgegeben von dem Kolonial-Wirtschaftlichen Komitee. (Beilage zum "Deutschen Kolonialblatt," xiv. Jahrgang.) Berlin. Size 10 × 6½, pp. 198. *Maps.*

German Colonies—Bibliography. **Brose.**

Die deutsche Kolonialliitteratur im Jahre 1901. Zusammengestellt von Maximilian Brose. (Sonder-Heft der Beiträge zur Kolonialpolitik und Kolonialwirtschaft.) Berlin: W. Süsserott, 1903. Size 10 × 6½, pp. 66.

Missions. **Beach.**

A Geography and Atlas of Protestant Missions, their environment, forces, distribution, methods, problems, results, and prospects at the opening of the twentieth century. By Harlan P. Beach. Vol. i. Geography. Vol. ii. Statistics and Atlas. New York, 1901. Sizes (vol. i.) 9 × 5½ and (vol. ii.) 14½ × 10; pp. (vol. i.) x. and 572, (vol. ii.) 54 and maps. *Presented by the Author.*

The maps are by Bartholomew.

Statistics. **Keltie and Renwick.**

The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the Year 1903. Edited by J. Scott Keltie, with the assistance of I. P. A. Renwick. London: Macmillan & Co., 1903. Size 7 × 5, pp. xlviii. and 1364. *Price* 10*s.* 6*d. net. Maps and Diagrams.*

The maps show the new boundaries between Chili and Argentina, and between the Sudan and Abyssinia, and Asiatic railway projects. There are also statistical diagrams on commercial and other subjects.

Travel. **Hartert.**

Aus den Wanderjahren eines Naturforschers. Reisen und Forschungen in Afrika, Asien und Amerika, nebst daran anknüpfenden, meist ornithologischen Studien. Von Ernst Hartert. Berlin, etc.: R. Friedländer & Sohn, 1901–1902. Size 11½ × 7½, pp. xiv. and 330. *Maps and Illustrations. Price* 25 *m. Presented by the Author.*

Year-Book.

Year-Book of the Royal Society of London, 1903. London: Harrison & Sons, 1903. Size 8½ × 5½, pp. 282. *Portrait. Presented by the Royal Society.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Balkan Peninsula. **Peucker.**

Karte von Makedonien, Altserbien und Albanien. Scale 1 : 864,000 or 13·6 stat. miles to an inch. Mit kartographischen historischen und statistischen Beilagen zum Verständnisse der makedonischen Frage. Bearbeitet von Dr. Karl Peucker. Vienna: Artaria & Co. *Price* 1.50*m. Presented by the Author.*

A useful little map for general reference in connection with the present Macedonian question. The historical notes which are added give a chronological account of the more important events in connection with the region from the earliest times.

Baltic Sea. **Geinitz.**

Das Stromsystem des nachglazialen Südwest-Balticums während der Landhebung in der Abschmelzperiode. Entworfen von E. Geinitz. Scale 1 : 500,000 or 7·8 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Tafel 3. Gotha: Justus Perthes. *Presented by the Publisher.*

England and Wales. **Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from March 1 to 31, 1903.

10 miles to 1 inch:—

Great Britain, with water printed in colour, 1, 2, 3, 4, 5, 6, 7, 8. 1*s. each.*

4 miles to 1 inch:—

Hill-shaded map, printed in colours, in sheets (9 and 10), 11, 12. 1*s.* 6*d. each.*

2 miles to 1 inch :—

Printed in colours, 78, 79, 86, 87, 95, 97, 1*s. each*; folded in covers or flat in sheets.

1 inch :—

With hills in brown or black, 65, 66, 72, 73 (engraved). 1*s. each.*

Printed in colours, 88, 89, 97, 98, 99, 100, 102, 114, 135, 136, 1*s. each*; (90 and 91) combined, 1*s.* 6*d.*

6-inch—County Maps :—

Bedfordshire, 14 S.W. **Cambridgeshire,** 4 S.W., 5 S.W., 6 N.E., 7 N.W., 10 N.W., S.E., 11 S.E., 12 N.W., S.E., 14 N.E., 20 N.E., S.E., 33 N.E., S.W., 38 S.E., 45 S.W. **Cardiganshire,** 4 N.E., 5 N.E., S.W., S.E., 8 N.W., N.E., 12 N.E. **Dorset,** 22 S.W., 40 N.W., S.W., 44 N.E., 47 N.W., 53 N.W., N.E., S.W., 54 N.W. (N.E. and S.E.), 55 S.W., S.E. **Gloucestershire,** 1 S.E., 2 S.W., 3 N.E., S.E., 4 N.W., S.W., 5 S.E., 6 S.W., S.E., 7 S.W., 8 S.W., 10 S.W., S.E., 12 N.W., N.E., S.W., S.E., 13 S.W., S.E., 14 N.E., S.W., S.E., 15 N.W., 19 N.W., N.E., S.E., 20 N.W., N.E., S.W., S.E., 21 N.W., N.E., S.W., S.E., 22 N.W., S.E., 25 S.E., 28 N.E., S.E., 29 N.W., N.E., S.W., 31 N.W., 32 S.W., S.E., 33 N.W., 35 N.W., N.E., S.W., S.E., 36 N.W., 37 N.W., S.W., 40 N.E., 41 S.E., 50 N.W. **Huntingdonshire,** 11 S.E., 23 N.E., S.W., 26 S.E., 28 S.W. **Montgomeryshire,** 5 N.E., 16 S.E., 26 N.W., N.E., 27 N.W., S.W., 28 N.W., N.E., S.W., S.E., 29 N.W., N.E., S.E., 30 N.W., N.E., S.W., 33 N.W., N.E., S.E., 34 N.W., N.E., S.W., S.E., 35 N.W., N.E., S.W., S.E., 36 N.W., N.E., S.W., 39 N.E., 40 N.E., S.W., S.E., 41 N.W., N.E., S.E., 42 N.W., N.E., S.W., 43 N.W., 46 N.W., N.E., 47 N.W., 50 N.E. **Shropshire,** 32 S.E., 42 N.W., 43 S.E. **Staffordshire,** 51 S.W. **Warwickshire and Do. (Det.),** 44 S.W., 50 N.W., S.W., 53 S.W. **Worcestershire and Do. (Det. Nos. 3, 4, 5, 6, 7),** 43 S.E., 44 N.W., 48 S.E., 49 S.W., S.E., 50 S.W., 51 S.W., 53 S.E., 55 N.W., N.E., S.W., S.E., 57 N.E., S.W., S.E., 58 N.W., 61 N.W., N.E., 62 S.E., 64 N.E. 1*s. each.*

25-inch—County Maps :—

Cambridgeshire, V. 8; XXXVII. 9, 13; XLIII. 9, 13; **XLIX.** 8, 10, 12; LIV. 2, 3, 5, 8, 15, 16; LV. 7, 8, 9, 10; LVIII. 1, 5, 6, 9; LXII. 4. **Dorset,** VI. 5, 6, 8, 13; XI. 3, 11, 12, 13, 15, 16; XII. 9; XXIX. 8, 13, 16; LVIII. (4 and 8). **Gloucestershire,** XVII 2, 5, 6, 8, 12, 15, 16; XVIII. 1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13; XXVI. 2; XXXI. 3; XXXII. 1, 2, 5, 6, 7; XXXIII. 10, 14, 16; XXXVII. 3, 7, 11; XLI. 5, 6, 7, 8; XLII. 6, 13; XLIII. 13; XLVIII. 4, 15; XLIX. 13; L. 4, 7, 12, 13; LIII. 14; LV. 4; LVI. 2, 7; LVIII. 5; LIX. 1, 10, 15; LX. 2; LXV. 11; LXXVIII. 1. **Leicestershire,** IV. 16; V. 11; IX. 3; X. 1, 2, 6, 14; XVI. 7, 8, 11; XVII. 10, 14; XXII. 5, 11, 15. **Montgomeryshire,** XXXVIII. 10; XLIV. 2, 6, 8, 10, 11, 13; XLVIII. 13; XLIX. 1, 2, 5; XLIXa. 1. **Radnorshire,** II. 13; III. 13; IV. 1, 2, 4, 5, 7, 8; V. 1, 10; XI. 10. **Shropshire,** XLVIII. 16; XLIX. 11, 15; L. 13; LV. 16; LVI. 1, 3, 4, 5, 7, 10, 11, 13; LVII. 1, 5; LVIII. 13, 14, 16; LIX. 13; LXI. 8, 10, 11, 13, 15; LXII. 9, 10, 12; LXIII. 4, 8, 13, 14, 15; LXIV. 2, 3, 4, 7, 9; LXVI. 5; LXVIII. 1, 2, 6, 8, 10, 11, 12, 16; LXIX. 1, 2, 3, 4, 7, 11, 13; LXX. 3, 5, 6, 7, 11; LXXVI. 2, 3, 7, 10, 11. **Somerset,** XII. 1; LXXXIV. 5, 6, 8; LXXXVII. 4, 7; XC. 9, 13. **Staffordshire,** XLIX. 10, 11, 14, 15, 16; LV. 3, 7, 8, 15; LXI. 8; LXII. 10, 15; LXIV. 2, 3, 4, 6; LXVII. 9, 10. **Warwickshire,** IV. 2, 3, 4, 6. **Worcestershire,** XIII. 16; XIV. 14; XX. 4; XXI. 4, 8; XXII. 2, 4, 7, 8, 11; LIX. 8, 12; LX. 1, 2, 4, 5, 8. **Yorkshire,** CCLXXXIII. 4, 12; CCLXXXIV. 3, 9, 13; CCLXXXIX. 12. 3*s. each.*

(*E. Stanford, London Agent.*)

England and Wales. **Bartholomew.**

The Survey Atlas of England and Wales. A series of eighty-four plates of maps and plans, with Descriptive Text, illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed by and prepared under the direction of J. G. Bartholomew, F.R.S.E., F.R.G.S. Parts 3 and 4. Edinburgh: John Bartholomew & Co. Under the Patronage of the Royal Geographical Society, 1903. *Price* 2*s.* 6*d. each part.* *Presented by the Publishers.*

The following are the contents of the above parts:—Part iii., Text—Climate and Agricultural Statistics. Plates: 72, Section lxi., West Sussex; Section lxii., East Sussex; 81, Plans of Liverpool and Manchester; 83, Plans of Sheffield, Nottingham, Birmingham, and Leicester. Part iv., Plates: 30, Section xix., Doncaster and Retford; 31, Section xx., Lincoln and Louth; 68, Section lvii., Bideford and Launceston; 69, Section lviii., Exeter and Honiton. This atlas is being published in twenty-one monthly parts at 2*s.* 6*d.* each, but as Parts iii. and iv. both appear in April, there will be no part published in May.

Germany. **Braun.**

Der Schilling-See, Ostpreussen. Nach eigenen Lotungen gezeichnet auf Grund der Messtischblätter. Scale 1 : 50,000 or ·78 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Tafel 6. Gotha : Justus Perthes. *Presented by the Publisher.*

London. **Stanford.**

A New Map of Metropolitan Railways, Tramways, and Miscellaneous Improvements. Deposited at the Private Bill Office, November 29, 1902, for Session 1903. London : E. Stanford, 1903.

Portugal. **Serviço do Estado Maior.**

Carta dos Arredores de Lisboa. Scale 1 : 20,000 or 0·3 stat. mile to an inch. Sheets : 1–7, 9–20, 22–44, 59–61, 64, 69, 70, 74, 75, 79, 84, 85. Lisbon : Serviço do Estado Maior.

When complete, this map will consist of eighty-five sheets, each measuring about 13 inches by 17. It will include Lisbon and the surrounding country from Setubal on the south to Lourinhã on the north, and from the coast on the west to Villa Nova on the east. The map is printed in colours, and contours at 10-feet intervals are given.

ASIA.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets : 8 N.E., parts of district Dera Ghazi Khan, Bahawalpur (Native State), additions to 1897, 1902. 35 N.W., parts of Native States of Udaipur, Tonk, and Jodhpur (Rajputana), Gwalior, and Indore (C.I. Agency), additions to 1901. 42 N.E., parts of districts Shimoga and Chitaldroog (Mysore), additions to 1901. 51 N.W., parts of Native States of Gwalior (C.I. Agency), Jaipur, Karauli, Tonk, Bundi, and Kotah (Rajputana Agency), additions to 1901, 1902. 52 N.W., parts of Native States of Gwalior and Indore (C.I. Agency), Udaipur, Tonk, Jhalawar, and Kotah (Rajputana Agency), additions to 1901. 52 S.W., parts of Native States of Indore, Gwalior, Khilchipur, Rájgarh, and Narsinghgarh (C.I. Agency), and of Jhalawar, Kotah, and Tonk (Rajputana Agency), additions to 1901, 1902. 53 N.W., parts of Bhopal, Gwalior (Sindhia), Indore (Holkar), and Dewás (Native States, C.I. Agency), additions to 1896, 1902. 53 S.E., parts of Hoshangabad and Betúl (Central Provinces), and the Native States of Bhopal and Holkar (C.I. Agency), additions and corrections to 1899. 53 S.W., parts of Hoshangabad and Nimár (Central Provinces), Indore, Bhopal, Dewás, Dhár, and Gwalior (C.I. Agency), additions to 1899, 1902. 77 S.E., parts of districts Nellore, Cuddapah, North Arcot, and Chingleput (Madras Presidency), additions to 1899. 87 S.W., parts of districts Bahraich, Bara Banki, Fyzabad, Gonda, Hardoi, Lucknow, Rae Bareli, Sitapur, Sultanpur, and Unao (N.W. Provinces and Oudh), additions to 1901. 87 N.W., parts of districts Kheri, Bahraich, Sitapur, Bara Banki, Hardoi, and Gonda (United Provinces), additions to 1899. 128 N.E., parts of districts Chittagong (Bengal) and Akyab (Burma), additions to 1898, 1899.—The Central Provinces, 16 miles to an inch, 2 sheets, additions to 1901.—Map of the Central Provinces and Berar, 32 miles to an inch, additions to 1901, 1902.—Map of the North-Western Provinces and Oudh, in April, 1901, 32 miles to an inch, additions to April, 1901.—Lower Provinces, Revenue Survey, 1 inch to a mile. Sheet No. 7, district Bhaugulpoor, additions to boundaries, 1897, 1900.—District Darjeeling, 4 miles to an inch, 1901.—District Karnal, 1870-73 and 1887-88, 4 miles to an inch, 1902.—District Patna, 4 miles to an inch, additions and corrections up to November, 1899, 1901.—Assam Survey, 1 mile to an inch. Sheet No. 27 (Preliminary Edition). District Kámrup, Seasons 1884–86, 90–91, and 96–97, 1902.—Bengal Survey, 1 mile to an inch. Sheets : 109, districts Muzaffarpur and Champaran, Seasons 1894–96, 1901 ; (Preliminary Edition) 140, district Muzaffarpur, Seasons 1895–96, 1901 ; 224, district Cuttack, Seasons 1888–89 and 1894–95, 1901.—Bombay Survey, 1 mile to an inch. Sheets : (Second Edition) 97, parts of district Ahmedabad, Baroda State, and Kathiawar Agency, Seasons 1866–67, 1868–69, 1902; 137, district Thana, Season 1881–82, 1902; 138, Island of Bombay and District Thana, Season 1880–81, corrected up to February, 1898, 1901 ; 204, districts Sátára and Ratnagiri and Kolhapur and Southern Maratha Agency, Seasons 1883–86, corrected up to June, 1899, 1902 ; 214, parts of district Panch Mahals and Rewa Kantha Agency (Bombay), and of Jhábua (Rajputana), Kusalgarh and Banswara States (Central India), Seasons 1884–85–86, 1902 ; 247, district North Kánara, Season 1895–96, 1901 ; 295, districts Sholapur, Poona and Ahmednagar and Nizám's Dominions, Seasons 1876–78, 1902 ; 296, districts Poona and Sholapur and part of Nizam's Dominions, Seasons 1875–76, 1902; 314, part of district Khandesh, Seasons 1875–77, additions and

corrections up to 1901.—Burma Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 71 (New Series), district Minbu, Seasons 1897–98, 1901; (Preliminary Edition) 192 (New Series), district Shwebo, Seasons 1892–94, 1901; (Second Edition) 243 (261, Old Series), districts Mandalay, Sagaing, and Kyaukse, Seasons 1893–94 and 1898–99, 1902; (Preliminary Edition) 291 (New Series), parts of Myelat and Southern Shan States, Seasons 1898–99, 1901; (Preliminary Edition) 468 (New Series), district Tavoy, Seasons 1891–93, 1901.—Upper Burma Survey, 1 mile to an inch. Sheets: (Preliminary Edition) 292 (New Series), Myelat and Southern Shan States, Seasons 1898–99, 1901; (Preliminary Edition) 337, 338 (New Series), parts of Southern Shan States, Seasons 1898–99, 1901; (Preliminary Edition) 377 and 378 (New Series), part of Northern Shan States, Seasons 1898–99, 1901; 380 and 381 (New Series), parts of Northern and Southern Shan States, Seasons 1897–98, 1902; (Preliminary Edition) 388 (New Series), Southern Shan States, Seasons 1897–98, 1901.—Central India and Rajputana Survey, 1 mile to an inch. Sheet No. 203, parts of Oodeypore (Rajputana Agency), and of Holkar and Sindhia (C.I. Agency), Seasons 1870–71–72, additions to railways, 1899.—Madras Survey, 1 mile to an inch. Sheet No. 81 and part of 54, part of district Mysore (Mysore), Seasons 1884–85, additions and corrections to February, 1890, 1902.—North-Eastern Frontier, 4 miles to an inch. Sheets: (Second Edition) 15 S.W., parts of districts Cachar, Sylhet, Lushai hills, and Manipur Native State (Assam), Chin hills (Upper Burma), and Hill Tippera, Native State (Bengal), Seasons 1860–74, 1893–94, and 1899–1900, 1902; 22 S.E. and 23 N.E., Burma and China, Yunnan Province, Season 1894–95, 1896–97, and 1899–1900, 1902; 31 S.E., China, Yunnan Province, Seasons 1898–1900, 1902.—North-Western Provinces and Oudh Survey, 1 mile to an inch. Sheets: 18, district Meerut, Seasons 1879–81, additions to railways, village boundaries, etc., to January, 1901; 19, districts Meerut and Bulandshahr, Seasons 1881–82, additions to village boundaries and railways to January, 1901; 23, districts Aligarh and Muttra and Bharatpur State, Seasons 1872–74 and 1883–84, additions to railways, etc., up to June, 1899, 1902; (Second Edition) 31, districts and Meerut and Moradabad, Seasons 1873–74, 1876–77, and 1879–81, 1901; 35, district Aligarh, Seasons 1882–83, with village boundaries and additions and corrections to canals, roads, etc., up to January, 1899, 1902; 37, districts Aligarh, Etah, Muttra, and Agra, Seasons 1871–73 and 1883–84, corrected up to March, 1899, 1901; 190, districts Basti and Gorakhpur, Seasons 1883–87, additions and corrections up to August, 1898, 1901.—Maymyo and surrounding country, 1 mile to an inch, Season 1898–99, 1902.—Assam, district Lakhimpur, 12 miles to an inch, 1902.—Bengal, district Gaya, 9·5 miles to an inch, corrected up to 1901, 1902; district Midnapore, 13·5 miles to an inch, corrected up to 1901, 1902; district Muzaffarpur, 8 miles to an inch, corrected up to 1901, 1902; district Mymensingh, 8 miles to an inch, corrected up to 1901; district Puri, 8 miles to an inch, corrected up to 1901, 1902; district Rangpur, 8 miles to an inch, corrected up to 1901, 1902; district, 24 Parganas, and part of the Sundarbans, 8 miles to an inch, 1902.—Survey of India Department, Chart of Triangulation and Traverse, No. 12 party (Sind), 2 miles to an inch, Seasons 1897–98–99–1900. Sheets: (Second Edition) 20, parts of Kalát (Baluchistan) and Sind, 1902; 39, 78, and 96 (Sind), 1902; No. 15 party (Baluchistan), 8 miles to an inch, Season 1884–85. Sheet 12 S.W. (Persia and Afghanistan), 1902.—No. 1, Preliminary Chart of the Secondary Triangulation of the Mandalay Minor Longitudinal Series, Season 1899–1900, scale 4 miles to an inch, 1902.—Index to places in the Provincial Map of North-Western Provinces and Oudh, Calcutta, 1899.—Index to places in the Provincial Map of Central Provinces, Calcutta, 1897. *Presented by H.M. Secretary of State for India, through the India Office.*

Persia. **Stahl.**

Routenkarte von der russischen Grenze nach Tabriz und Kaswin. Von A. F. Stahl. Scale 1 : 840,000 or 13·2 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Tafel 5. Gotha: Justus Perthes. *Presented by the Publisher.*

Turkistan. **Habenicht.**

Die Terraindarstellung im "Neuen Stieler." Von H. Habenicht. Turkestan im "Alten Stieler."—Turkestan im "Neuen Stieler" (Terrain mit Schrift und Schatten).—Turkestan im "Neuen Stieler" (Terrain ohne Schatten und ohne Schrift).—Turkestan im "Neuen Stieler" (Terrain mit Schatten, aber ohne Schrift). *Petermanns Geographische Mitteilungen*, Jahrgang 1903, Tafel 4. Gotha: Justus Perthes. *Presented by the Publishers.*

AFRICA.

Madagascar. **Service Géographique des Colonies.**

Service Géographique des Colonies. M. Camile Guy, Chef du Service. Madagascar. Carte dressée sous la direction de M. Emile Gautier d'après les travaux du Service Topographique de Madagascar, les cartes du Service Hydrographique de la Marine, les levés des missionnaires et les travaux des explorateurs A. & G. Grandidier, E. Gautier, Douliot, Catat, R. Baron, etc. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Paris: Augustin Challamel, 1902. *Presented by the Chef du Service Géographique des Colonies.*

The surveys of the Service Topographique de Madagascar and Service Hydrographique de la Marine, combined with those of various missionaries and other travellers, form the basis of this map. It is orographically coloured, and shows elevations from sea-level to over 2000 metres by means of six different tints. The names of tribes are given in red.

Rhodesia. **Stanford.**

A Map of Rhodesia divided into Provinces and Districts under the Administration of the British South Africa Company. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. 6 Sheets. London: E. Stanford, 1903. *Price* £1 4*s.*

A new edition revised and brought up to date. Owing to the large amount of fresh information that has been furnished lately by officers of the British South Africa Company and others, it has been found necessary to make many extensive alterations and additions, and two of the northern sheets have been practically redrawn.

AMERICA.

Canada. **Surveyor-General's Office, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 3 stat. miles to an inch. Pasquia Sheet (38), West of Second Meridian; revised to June 5, 1902: Maple Creek Sheet (58), West of Third Meridian; revised to April 23, 1902: Milk River Sheet (65), West of Fourth Meridian; revised to June 2, 1902: Medicine Hat Sheet (66), West of Fourth Meridian; revised to April 26, 1902: Lethbridge Sheet (73), West of Fourth Meridian; revised to June 3, 1902: Blackfoot Sheet (75), West of Fourth Meridian; revised to June 10, 1902. Ottawa: Surveyor-General's Office. *Presented by the Surveyor-General of Canada.*

United States. **Rand, McNally & Co.**

Indexed County and Township Pocket Maps of Nebraska. Scale 1 : 1,140,480 or 18 stat. miles to an inch. Nevada. Scale 1 : 1,710,720 or 27 stat. miles to an inch. New Hampshire. Scale 1 : 633,600 or 10 stat. miles to an inch. Chicago and New York: Rand, McNally & Co. *Price* $0.25 *each. Presented by the Publishers.*

These are new editions.

GENERAL.

World. **Stieler.**

Neue, neunte Lieferungs-Ausgabe von Stieler's Hand-Atlas, 100 Karten in Kupferstich 15 & 16 Lieferung. Gotha: Justus Perthes. *Price* 60 *pf. each part.*

These two parts, which are in one cover, contain, Nos. 32 and 33, two sheets (Nos. 1 and 2) of a four-sheet map of Spain and Portugal, by C. Vogel, on the scale of 1 : 1,500,000. No. 83, a map of Western Canada, by H. Habenicht, on the scale of 1 : 7,500,000; and No. 85, a small-scale (1 : 12,500,000) general map of the United States and Mexico, by H. Habenicht and H. Salzmann. With the exception of No. 85, the United States and Mexico, all are revised editions, but this latter is entirely new. As large-scale detailed maps of the United States are also given in the atlas, this general map only indicates the leading features of the country as a whole, and very properly contains but few names.

World. **Bartholomew.**

The British Empire Map of the World. By G. B. Parkin, C.M.G., LL.D., and J. G. Bartholomew, F.R.G.S. Scale 1 : 2,700,000 or 42·5 stat. miles to an inch. 2 Sheets. Edinburgh: J. Bartholomew & Co. *Presented by the Publishers.*

This is an educational wall-map of the world in two sheets on Mercator's projection, measuring about 3½ feet × 5¾ feet. British possessions are coloured red, and all other countries neutral tint. Principal steamship routes, railways and telegraphs are shown, as well as British and foreign coaling stations. Mr. Stanford Fleming's twenty-four-hour zone notation for a recognized standard uniform time is marked along the upper margin of the map. Apparently with a view to correcting the erroneous idea as to relative sizes of countries due to the projection employed, diagrams are given

at the bottom of the map showing the comparative area of British possessions; but from an educational point of view it would have been preferable to have drawn the map in another projection. There are also diagrams showing the growth of the area, population, and trade of the British Empire.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during January and February, 1903. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
2253 m	= 14·0	England, south coast:—Dartmouth harbour. 2*s.* 6*d.*
3292 m	= 6·0	Scotland, west coast:—Loch Alsh and Kyle Rhea. 2*s.* 6*d.*
1624 m	= 8·0	England, east coast:—Scarborough bay. 1*s.* 6*d.*
2330 m	= 0·7	Norway, south coast:—Christiania fiord. 3*s.*
151 m	= 7·2	France, south coast:—Toulon harbour. 2*s.* 6*d.*
3330 m	= 2·0	Iceland, east coast:—Seidis fiord and trading station. 1*s.* 6*d.*
3323 m	= 1·92	Newfoundland, east coast:—Hall bay and Sunday cove. 1*s.* 6*d.*
3320 m	= {6·0 / 3·0}	Newfoundland. Thimble tickles and Glover harbour:—Head of Seal bay. 1*s.* 6*d.*
3306 m	= 2·0	Newfoundland. Trinity bay:—Smith and Random sounds, eastern part. 2*s.* 6*d.*
3307 m	= 2·0	Newfoundland. Trinity bay:—Smith and Random sounds, western part. 2*s.* 6*d.*
3273 d	= 0·95	The West Indies. 2*s.* 6*d.*
3322 m	= 0·35	South America, north-east-coast:—Orinoco river. 2*s.* 6*d.*
3279 m	= 5·95	China:—Hongkong waters, east. 2*s.* 6*d.*
1288 m	= 6·0	China, Yang-tse-kiang:—Chin kiang fu and Silver island. 2*s.* 6*d.*
3328 d	= 4·0	New Zealand, east coast:—Kati Kati harbour. 1*s.* 6*d.*
3321 d	= 6·0	New Zealand, east coast:—Gisborne roads. 1*s.* 6*d.*
2747 d	= 3·0	Australia, south coast:—Entrance to Port Phillips, etc. 3*s.*
972 m	=	Philippine islands. New plan:—Port Romblon.
991 m	=	Japan:—Anchorages on the coast of Yezo island. Plan added:—Monbetsu road.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.	Cancelled by	No.
2253 Dartmouth harbour.	New plan. Dartmouth harbour	2253
2455 Kyle Rhea. 1846 Kyle Akin harbour.	Loch Alsh and Kyle Rhea	3292
1624 Scarborough.	New plan. Scarborough bay	1624
151 Toulon harbour.	New plan. Toulon harbour	151
2330 Svenöer to Koster islands including Christiania fiord.	Christiania fiord	2330
1535 Plan of Seidis fiord on this sheet.	New plan. Seidis fiord and trading station	3330
2852 San Luis pass, etc.		
3181 Plan of Silver island on this sheet.	New chart. Chiang fu and Silver island	1288
2747a Entrance to Port Phillip.	New plan. Entrance to Port Phillip	2747

Charts that have received Important Corrections.

No. A to P, Index charts (16 sheets). 2296, Gulf of Bothnia, Sheet I.:—South Quarken to Hornslandet. 3300, Baltic sea:—Windau. 790, Denmark:—Approaches to Copenhagen. 2690, France:—Brest roadstead. 366, Cape Verde islands. 2740, Iceland and the Færoe islands. 546, South America, east coast:—Espirito Santo bay and port Victoria. 2095, Africa, south coast:—Cape of Good Hope and adjacent coasts. 385, Africa, south coast:—Plettenberg bay. 1223, Africa, south coast:—Kowie river entrance. 643, Africa, east coast:—Port Natal. 2908, Africa, east coast:—Port Natal entrance. 597, Africa, east coast:—Delagoa bay to Guardafui. 644, Africa, east coast:—Delagoa bay. 646, Africa, east coast:—English river, bar and harbour. 650, Africa, east coast:—Plans on the

east coast of Africa. 921, Africa, east coast:—Chiluan island. 1421, Africa, east coast:—River Chiude. 2865, Africa, east coast:—Mouths of the river Zambezi. 653, Africa, east coast:—Ports of Conducia, Mozambique, and Mokambo. 684, Africa, east coast:—Mto Mwara and Mikindani harbours. 681, Africa, east coast:—Lindi river. 677, Africa, east coast:—Mchinga bay. 687, Africa, east coast:—Kiswere harbour. 661, Africa, east coast:—Kilwa Kisiwani. 458, Africa, east coast:—Mafia island and channels. 674, Africa, east coast:—Dar es Salaam. 1310, Africa, east coast:—South-west coast of Pemba island. 1812, Africa, east coast:—West coast of Pemba island. 663, Africa, east coast:—Mansa and Tanga bays. 238, Africa, east coast:—Kilifi river and approaches. 667, Africa, east coast:—Port Malindi and approaches. 1747, Africa, east coast:—Lamu harbour. 669, Africa, east coast:—Lamu, Manda, Patta, and Kwyhu bays. 860, Africa, east coast:—Kisimayu bay. 671, Africa, east coast:—Plans on the east coast of Africa. 760, Madagascar, southern portion:—Cape St. Mary to Bevato island and Matatane. 692, Madagascar:—St. Augustine and Tulléar bays. 2464, Madagascar:—Nosi Andrianmitarika to Mananonoka point. 1036, Madagascar:—Anchorages on the coast of Madagascar. 758, Madagascar, northern portion:—Cape St. Andrew to Antongil bay. 378, Madagascar:—Maromanjo point to Makambytra. 708, Madagascar:—Anchorages on the west coast. 701, Madagascar:—Bombetoke bay. 377, Moramba bay to Maromanjo point. 702, Madagascar:—Mahajamba bay. 704, Madagascar:—Nosi Shaba to Moramba bay. 706, Madagascar:—Pasindava and adjacent bays. 707, Madagascar:—Ambavatobi bay. 1002, Madagascar:—Diego Suarez bay to Andranoaombi bay. 317, Madagascar:—Anchorages on the north-west coast. 1054, Madagascar:—Ports and anchorages in the northern portion. 1064, Madagascar:—Plans on the north-east coast. 1116, Madagascar:—Diego Suarez bay. 680, Madagascar:—Anchorages on the east coast of Madagascar. 759B, Madagascar:—Antongil bay to Ambatosca. 686, Madagascar:—Anchorages on the east coast. 563, Indian ocean islands:—Plans in the Comoro islands. 2066, Indian ocean islands:—Anchorage in Comoro island. 851, Indian ocean islands:—Bassas da India and Europa island. 833, Bay of Bengal:—Rangoon river. 2987, Philippine islands:—San Pedro bay to Libukau islands, etc. 976, Philippine islands:—Manila bay. 2062, Cochin China:—Tongking gulf. 913, Korea, western coast:—Mackau group to Clifford islands. 2985, Japan:—Saiki bay. 1510, Sandwich islands.
(*J. D. Potter, Agent.*)

North Atlantic Ocean and Mediterranean Sea. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for April, 1903. London: Meteorological Office. *Price* 6*d*. *Presented by the Meteorological Office, London.*

United States Charts. **United States Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for March, and of the North Pacific Ocean for April, 1903. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Andaman and Nicobar Islands. **Man.**

One hundred and eleven Photographs of the Andaman and Nicobar Islands, taken by E. H. Man, C.I.E., Esq. *Presented by E. H. Man, Esq.*

This is a most interesting series of platinotypes carefully selected and arranged in an album. From an anthropological point of view the photographs are important.

(1) Lighthouse on Table island; (2) Volcano on Barren island; (3) Principal anchorage at Port Blair; (4) Port Blair harbour from Government House; (5) Andamanese poling canoe and shooting fish with bow and arrow in creek near Port Blair harbour; (6) Bungalow at Mount Harriet, Port Blair; (7) Sher Ali, the assassin of Lord Mayo; (8, 9, and 13) Andamanese long resident at Port Blair; (10) Andamanese equipped for hunting; (11) Andamanese men long resident at Port Blair; (12) Andamanese women long resident at Port Blair; (14) Native of North Andaman, showing the three rows of tattoo marks which distinguish these natives from those of South and Little Andaman; (15) Typical hut in long-established camping-ground in South Andaman; (16) Typical hut adjacent to that in photograph 15; (17) Andamanese in canoe at Interview island; (18) Andamanese dancing to accompaniment on sounding-board; (19) Typical Little Andaman hut with Onges (natives of that island) and Mr. M. V. Portman; (20) Onges with a Little Andaman canoe; (21) Onges; (22) Natives of Arong village, Car Nicobar, with an Andamanese visitor; (23 and 24) Offandi, headman of Mús village, Car Nicobar; (25–27) Car Nicobarese lads; (28) Natives of Car Nicobar; (29) Mission house of S.P.G. catechist (Madrasi) at Mús; (30) "Nyá-kopáh," sacrificial offering of fruit and vegetables, Car Nicobar; (31) Hut

and "nyá-kopáh" at Mús, Car Nicobar; (32) Typical Car Nicobarese; (33) A common type of hut at Car Nicobar, known as the "talika;" (34) Two "mafai" being carried in covered chairs, Car Nicobar; (35) A village graveyard with mortuary-hut, Car Nicobar; (36) Landing-place at Batti Malve island; (37) Landing-place at Sánénya, Chowra island; (38) Natives of Chowra island; (39) Women making pots at Chowra island; (40 and 41) Youths of Chowra island; (42) Hut on Teressa island, with grave of recently deceased owner; (43 and 44) Natives of Teressa island; (45) Back of bungalow of officer in charge of the Nicobars at Nankauri island during the existence of the settlement 1869–88; (46) R.I.M.S. *Nankauri*, station steamer at Nankauri island, 1884–88; (47) Malacca village, Nankauri harbour; (48) Malacca village at low spring tide; (49 and 50) Malacca village; (51) Malacca village, showing the two ordinary types of huts; (52) Natives of Nankauri harbour in visiting attire; (53) Inúanga village, Nankauri harbour; (54) Native of Nankauri island playing on bamboo lyre; (55) Native of Nankauri island playing on flageolet; (56) Hut in a Nankauri village; (57 and 58) Native of Nankauri island; (59) Hut on site of the Moravian Mission establishment of 1768–87 near Malacca village; (60 and 61) Natives of Malacca village with four Andamanese youths; (62) Kabila village, Nankauri island; (63 and 64) Typical natives of Nankauri harbour; (65) Canoes at Nankauri, as decorated on a memorial feast day; (66 and 67) An octogenarian of Malacca village; (68) Natives of Nankauri in visiting attire; (69) A fowl cage and a fish trap; (70) A "pomák-ónh" and sucking-pig cage; (71) Natives of Nankauri harbour in visiting attire; (72) Mode of catching rain-water from coconut trees; (73) Burial-ground behind a village at Nankauri; (74) Typical native of Nankauri harbour; (75) A young couple at Nankauri; (76) A native of Nankauri, showing mode of wearing the "neng;" (77 and 78) Native of Nankauri harbour; (79) Inaka village on east coast of Camorta island; (80–83) Types of old men and women; (84) Dáng (headman) and others in front of his hut at Condul island; (85) Natives of Condul island; (86) Natives of Láfúl village, Great Nicobar; (87) Kopenhéat village, Great Nicobar; (88) Two Shom Peñ natives in the midst of a group of coast natives in visiting attire; (89) Types of coast and Shom Peñ natives; (90, 91, 95, and 99) Galatea river, Great Nicobar; (92 and 96) Láfúl river, Great Nicobar; (93) Plantation of *Pandanus mellori* and coconut trees on east coast of Great Nicobar; (94) Alexandra river, Great Nicobar; (97, 98, 100, 101, 103, and 104) Shom Peñ natives of the interior of Great Nicobar; (102) Shom Peñ hut on bank of Alexandra river; (105) Shom Peñ hut and garden on border of Alexandra river; (107) Shom Peñ bark cooking-utensil; (107 and 108) A Shom Peñ woman reared by the coast tribe; (109) Head of Láfúl river in the dry season; (110) Coast and Shom Peñ natives; (111) Shom Peñ clearing near Ganges harbour.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder, herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Heft 2. Malayischer Archipel. Von Dr. G. Karsten. Jena: Gustav Fischer, 1903. *Price* 4*m*.

This is the second of a series of eight portfolios in course of publication, containing photographic reproductions illustrating the types of vegetation of different parts of the world. The present issue comprises six plates of the vegetation of the Malay archipelago, from photographs taken by Dr. G. Karsten in 1889, accompanied by descriptive letterpress. The price to subscribers taking the complete work is 2.50 marks for each part, but for one part only 4 marks.

Venezuela. **André.**

Eighty-eight Photographs taken during an Expedition to the Caura river, Venezuela, in 1900–1901, by E. André, Esq. *Presented by E. André, Esq.*

An account of the journey during which these photographs were taken was given in the *Geographical Journal* for September last. They are platinotypes of different sizes, and serve well to illustrate the scenery and native life of this imperfectly known part of South America.

(1) Waiomgomo house; (2, 3, 6, 72, 73, 75, and 88) Rapids of Mura; (4) Arrival at La Prision; (7) A Waiomgomo family; (8) Waiomgomo Indian catching bait; (9 and 10) Fishing with spear; (11) Fishing with bow and arrow; (12) Fishing with hook; (13) Smoking fish; (14 and 15) Making baskets; (16 and 17) Striking a bargain; (18–23) Making cassava; (24–27) Making a hammock; (28) Paying a debt; (29) Primitive cane-crusher; (30) Building a dark room; (31) Jacobson; (32) Pounding corn; (33) Our kitchen; (34) Receiving and counting; (35) Examining; (36) On the way to La Prision; (37) Nearing La Prision; (38) Cleaning plants; (39, 74, and 83) Packing plants; (40) Catching butterflies; (41 and 78) Butterflies; (42) *Nymphalis Orion* butterfly; (43) The relief party ready to start; (44) Cattle mill at La Prision; (45) Isidor, everyday dress; (46) Isidor, full dress; (47) Isidor's wife; (48) Isidor's

wife and children; (49 and 50) Waiomgomo woman and child; (51) Waiomgomo boy and girl; (52) Waiomgomo girls; (53) Maité, who died of starvation; (54) Waiomgomo with flute; (55) Waiomgomo woman; (56) Waiomgomo, Vicente; (57) Mr. André; (58 and 59) Mr. André in the "Pirate's" clothes; (60) Mr. André, starved; (61) Mr. André, photograph taken at Mura; (62) Hospital on the Nichare river; (63) The *Orinoco* at Mapire; (64) The *Caura* taking wood; (65) Ciudad Bolivar; (66) Forest scene near La Prision; (67) La Laja de Los Perros; (68 and 69) Waiomgomo Indian making arrows; (70 and 71) Waiomgomo house: (76) Indians crossing the rapids; (77) Miranda; (79) Departure of the relief party; (80) House at La Prision; (81) Snakes; (82) Waiomgomo making hammock; (84) On arrival at La Prision; (85) Mr. André, May 24, 1901; (86 and 87) Waiomgomo woman making a hammock.

Yunnan. **Watts-Jones.**

Two hundred and thirty-eight Photographs of Yunnan taken by Captain W. A. Watts-Jones, R.E. *Presented by Mrs. W. A. Watts-Jones.*

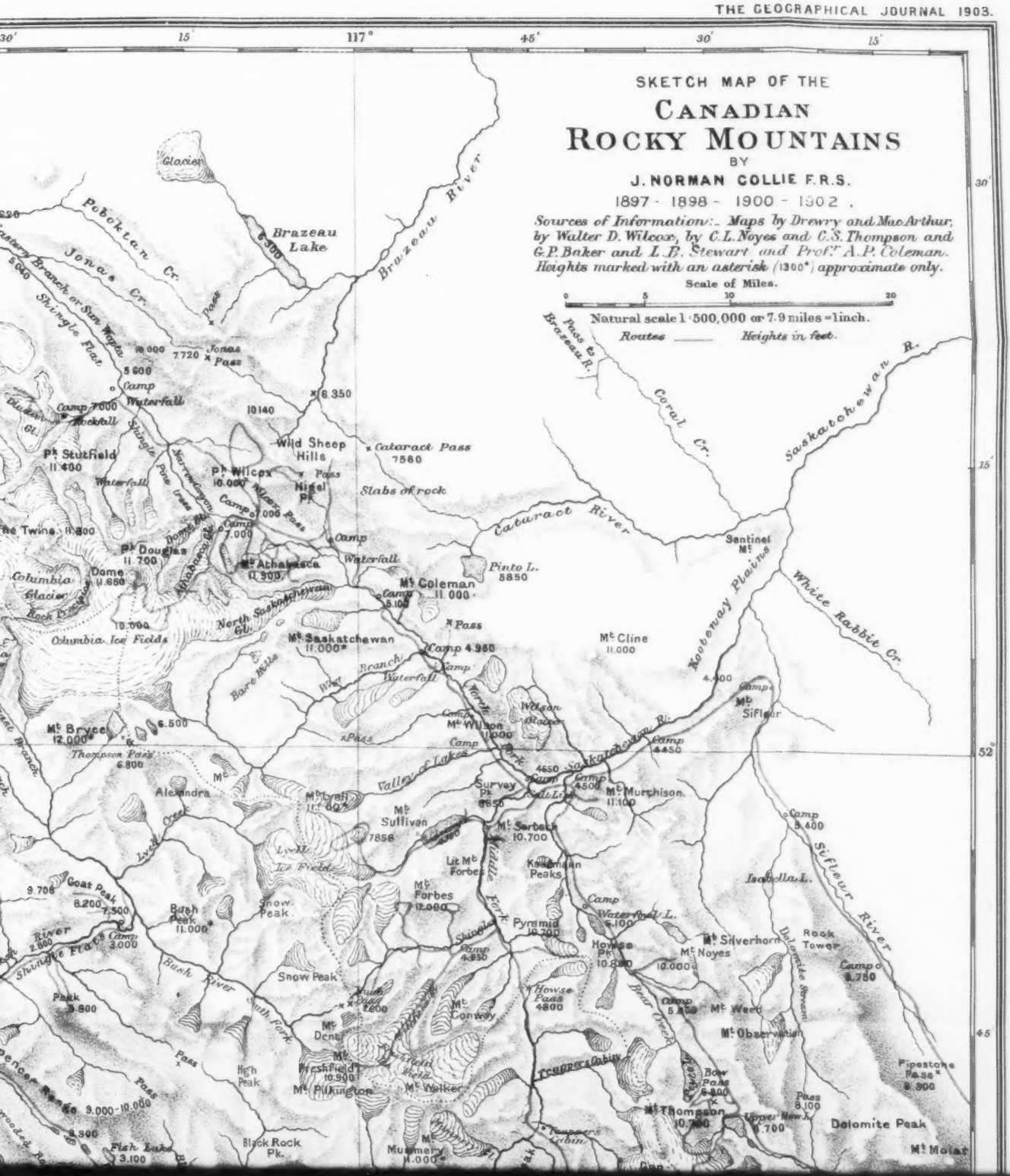
These photographs have been presented to the Society by Mrs. Watts-Jones, with the permission of the Yunnan Company, as a memorial of her husband, Captain W. A. Watts Jones, R.E., by whom they were taken during his surveying expedition for the railway route from Kunlong Ferry to the Yangtse kiang in 1898–99.

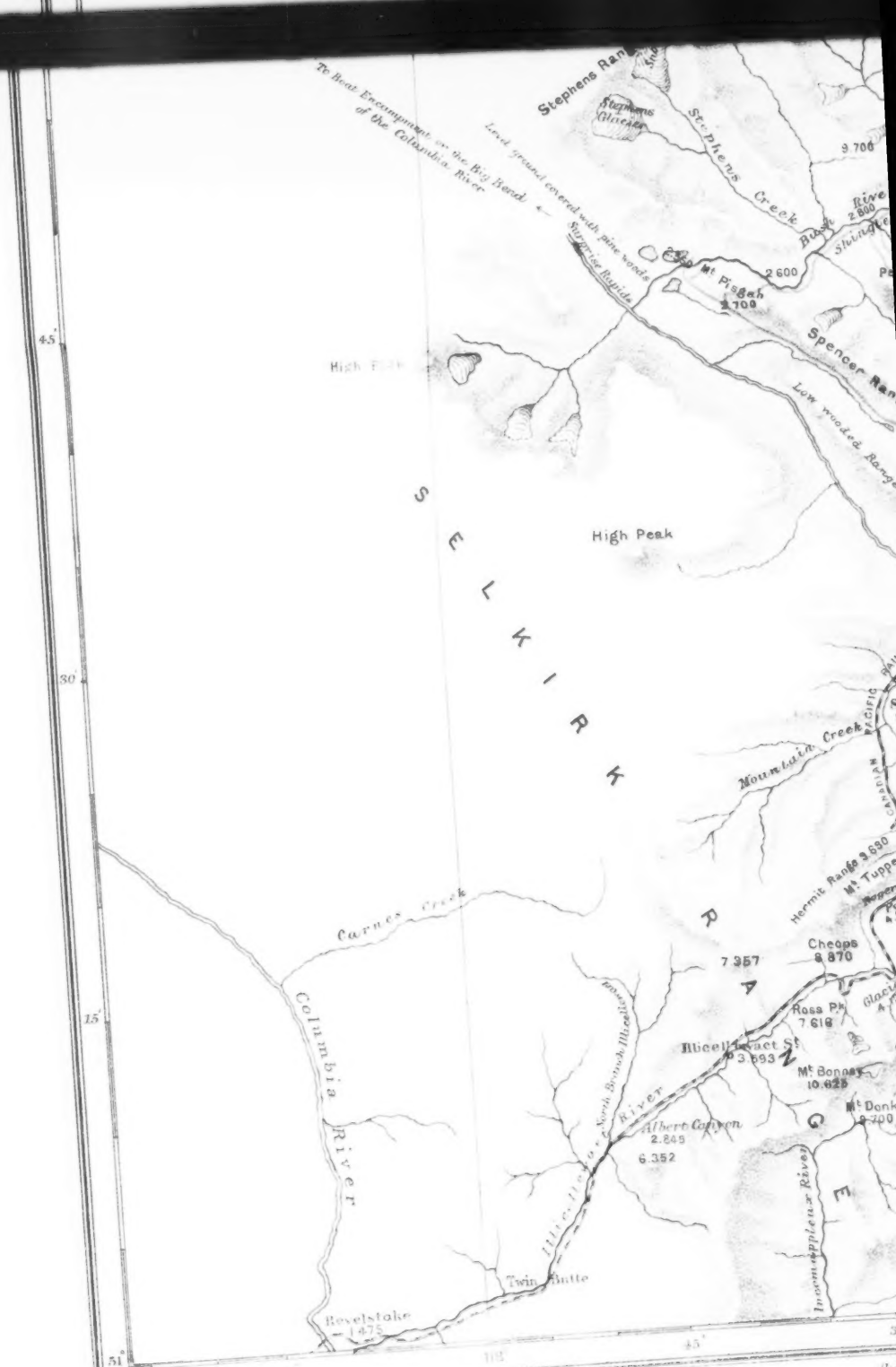
(1 and 4) An upper Irawadi steamer with three flats in tow; (2) An upper Irawadi timber raft; (3) Myothet, first stage on the Bhamo-Tali road; (5) The upper Irawadi; (6) Entrance to a village, showing posts to keep away the evil spirits, Kachin hills; (8) Yang-yu-chang, Kachin hills; (9 and 10) A Kachin village; (11) Mong-na plain, giant bamboo; (12) A village in the Nan-tien valley; (13) First view of the Mong-na plain; (14) Chinese Shan village in Mong-na plain; (15) Typical bit on the Mong-na plain; (16) Remains of ancient lake-bed plain, Nan-tien valley; (17) View of fort, the headquarters of Chinese levy, from near Pong-shi, Kachin hills; (18) Momein city and plain at sunset; (19) Momein city and plain, volcanic cone north of the city; (20) A quiet street in Momein; (21) Chain bridge over gorge between Mong-na and Nan-tien plains; (22) The Ting-Kwan (magistrate) of Momein and family; (23) The Ting-Kwan of Momein and Long-ling, Erh-fu; (24) Sons of Ting-Kwan of Momein; (25) The young Tsawba of Mong-na; (26) Middle gate of Momein; (27) Nan-tien valley, a party of Tibetans; (28) A soldier of the escort and interpreter's mule; (29) Waterfall where river leaves Momein plain; (30) A soldier of the Nan-tein Tsawba; (31) Chian suspension bridge over the Shweli river; (32) San-ko-pa on road from Yung-chang-fu to Shunning-fu; (33) Going down to the Salwen river; (34) Chinese village above Mong-kyen; (35) Mong-hsa market; (36) Chinese woman, Ping-chang; (37) Shan girl Mong-hsa; (38) A Chinese liquor-seller, Mi-pa-chiao; (39) A long-distance transport; (40) A short-distance transport; (41) Mule with two Chinese cooking-pans; (42) The escort carriers: the day's bag; (43) Mong-hsa town and plain; (44) Fording the Nam-ting at Mong-ka-ka; (45) A series of valleys parallel to the Nam-ting valley through which the Kunlong Yun-chau road runs; (46) Exit of Mong-hsa stream; (47) Part of the north wall of the Nam-ting valley; (48) Valley through which the Mong-yawing stream flows down to join the Nam-ting; (49 and 50) Upper gorge of the Nam-ting; (51) Looking south up and across the valley of the upper Nam-ting; (52) Lower gorge of the Nam-ting; (53) Alluvial fans below Mong-lai and head of upper gorge of Nam-ting; (54) A ford of the Nam-ting; (55) Salwen background to Me-kong; (56) Nam-ting valley, mile 128; (57) Nam-ting valley, mile 123; (58) Typical bit of road leading from Nam-ting to the Salwen; (59) Me-kong-Salwen watershed; (60) Valley leading from watershed to Yun-chau, showing former alluvial deposit; (61) Yun-chau from the east; (62) Sha-ho-bin, valley of the Yun-chau river, below Yun-chau; (63) Shunning-fu from the main gate; (64) Inn at Yun-chau; (65) The usual crowd, Shunning-fu temple; (66) Captain Watts-Jones's room in Shunning-fu temple; (67) Innkeeper and sweetmeat-sellers at Yun-chau; (68) Rice terraces, Shunning-fu valley; (69) A country bridge recently erected by public subscription, Yung-chang-fu road; (70) Bridge in Shunning-fu valley; (71) Granite slab bridge in Mung-lang valley; (72) Public bath house, Munglang; (73) Sunday morning, the interpreter acts as barber; (74) Lolo children, Hei-kau-lin; (75) Lolo women, Hei-kau-lin; (76) A Chinese lady travelling; (77) Pony eating sugar-cane; (78) The Lolo uplands north of Kung-lung; (79) Valley of the Mi-tu stream; (80) Mi-tu plain from summit of Chao-chu pass; (81) Group of temples outside Mi-tu; (82) The south end of Tali-fu lake; (83) Taking building timber to Hsia-kwan market; (84 and 99) A side lagoon of the Tali-fu lake; (85) The north end of the Tali-fu lake; (86) Entrance to a merchant's house, Hsia-kwan; (87) Hsia-kwan market; (88, 90, 104, and 105) Drawing in the net, Tali-fu lake; (89) Stone slab bridge; (90) Going to market, Hsia-kwan; (91) North gate of Tali-fu; (92) Going to market, Tali-fu; (93) The Yin-mu-ho firm, Hsia-kwan; (94 and 95) The vegetable market, Hsia-kwan; (96) Timber market, Hsia-kwan; (97) Children playing on floating timber, Ma-chu-i; (100) Fishing-boats, Tali-fu lake; (101) A

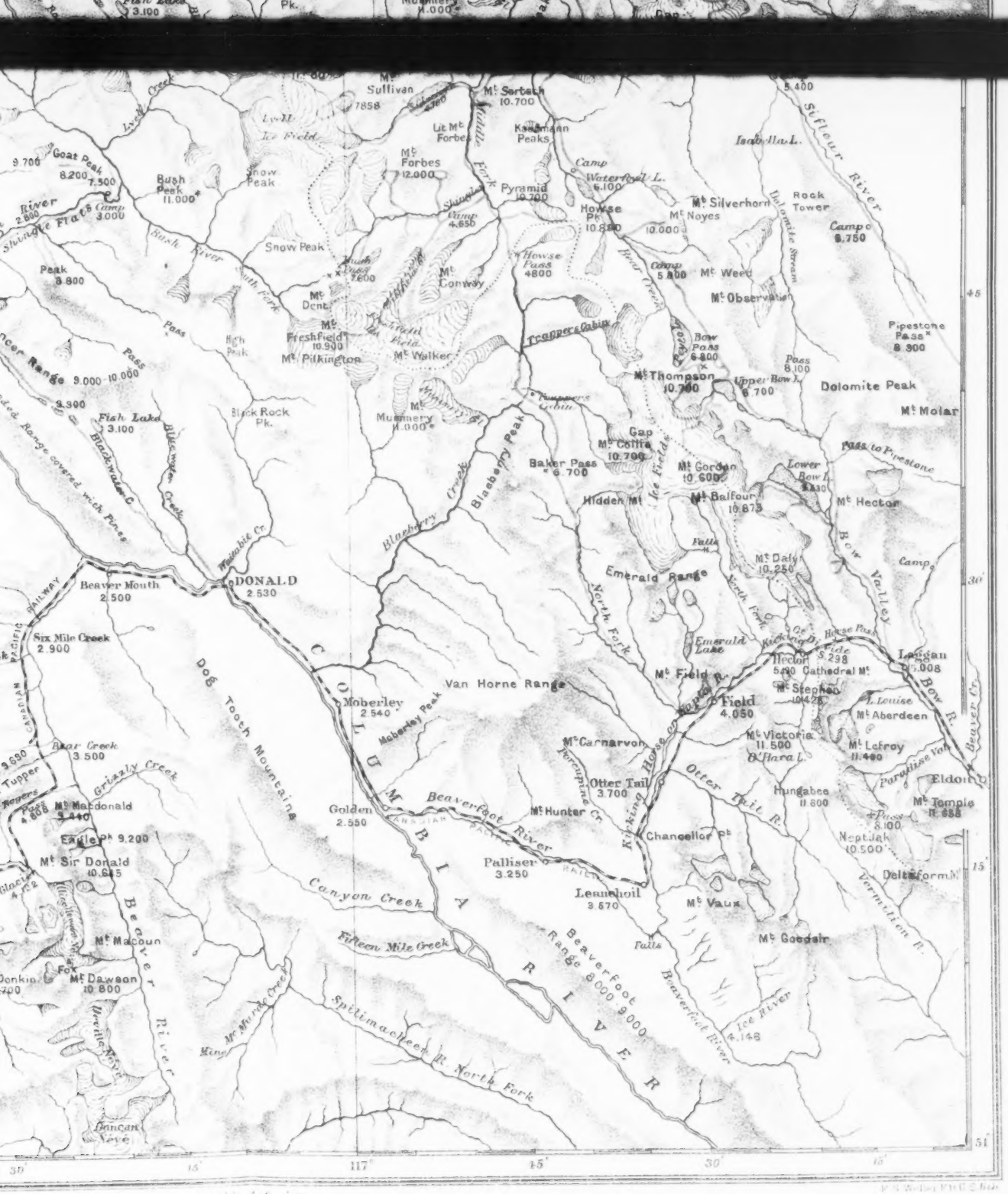
timber ship, Tali-fu lake; (102) Tali-fu lake, "Stand by to lower away;" (103) A youthful navigator, Tali-fu lake; (106) A fortified village; (107) An afternoon nap; (108) Head of the irrigation canal, Ming-chita-ho river; (109) On the bank of the canal; (110) Gorge between Ea-sai and Lang-kung-hsien plains; (111) Bridge over the canal; (112) Bridge over outlet of Chen-chuan-chu lake; (113) Aqueducts over outlet of Chen-chuan-chu lake; (114) Outlet of Chen-chuan-chu lake; (115) Yangtse river at Shih-ku; (116) Stone drum at Shih-ku; (117) Li-chiang peak, from south end of plain, elevation 18,000 feet; (118) Li-chiang peak, from middle of plain; (119) Li-chiang peak, from Li-chiang-fu; (120) The La-chi-pa plain and lake; (121 and 122) Li-chia women; (123) A poor man's house, Li-chiang-fu plain; (124) Chou-yang-su temple: the goddess and attendants; (125) Chu-yang-ssu temple, interior; (126) Entrance to Chu-yang-su temple; (127) The Me-kong, looking upstream from the Yun-chau Tali-fu road; (128) Si-chiang ferry over the Me-kong; (129) Ferry over the Me-kong; (130 and 131) Getting mules into the ferry-boat, Chin-chiang-kai; (132) Village of To-mei; (133) Crossing the Yangtse river; (134) Getting mules out of the ferry-boat; (135) Types, To-mei market; (136) To-mei market; (137) A French priest and part of his congregation, Pien-kio; (138) Landlady of a roadside tea-house, Yun-nan-hsien plain; (139) Goats crossing outlet of Yunnan-fu lake; (140) Sheep crossing outlet of Yunnan-fu lake; (141) Pit bank at Ma-kai, the westernmost coal-field of Yunnan; (142) On the wall of Tsu-hsiung-fu; (143) Lachman Jadu, surveyor; (144) Ram Sahad, surveyor, and his henchman; (145) Criminal carried in a cage; (146) Official carried in a chair; (147) A typical village of Central Yunnan; (148) Near Ma-lung-chau; (149) The red clay uplands of Eastern Yunnan; (150) View in Swen-wei; (151) Garden of the Buddhist convent where we lodged, Swen-wei; (152) Ferry over the Ko-tu river; (153 and 154) A Chinese punch and judy show; (155) In the purple sandstone country; (156) Water-tower, Hêng river valley; (157) The eastern tower of Wei-ning; (158) Lolos near Wei-ning; (159) On the Wei-ning plateau; (160) From Chao-tung to Wei-ning; (161) Ta-kuan-lao; (162) Gate on the Lao-wa-tan road; (163) A peep at the foreigner, Ta-kuan-lao; (164) A steep bit, Hêng river gorge; (165) Looking up the Hêng river from below Huang-go-chi; (166) Inn at Ta-kuan-lao; (167) Looking up the Hêng gorge from Ta-kuan-lao; (168) Huang-ching-pa; (169) Looking up the Hêng gorge from below Ta-kuan-lao; (170) Cliff above Tu-sa-kwan from upstream; (171) Cliff above Tu-sa-kwan from Tu-sa-kwan; (172) The end of the land journey, mules and mulemen of Captain Watts-Jones's party; (173) Coolie carrying three bales of cloth; (174) Coolie carrying white wax insects; (175) A twenty-ton cargo junk and small passenger junk; (176) Resting between rapids; (177) Lao-wa-tan to Sui-fu, mile 855; (178) An average bit of country; (179) Shooting a rapid, side road; (180) Shooting a rapid, main road; (181) In quiet water; (182) T'an-ton, mile 878; (183) Puerh-fu, mile 869; (184) Lao-wa-t'an to Sui-fu, mile 882; (185 and 187) Portaging at Hsin-tan; (186) Below Hsin-tan; (188) Ploughing a ricefield; (189 and 194) A river-side village; (190) Sui-fu; (191) A market boat; (192) Bound upstream; (193) A ferry; (195) On the beach; (196) View from where Captain Watts-Jones sat in the boat; (197 and 198) Junks at Ho-chiang-hsien; (199 and 200) Limestone gorge above Chung-king; (201) A lighthouse on the Yangtse; (202 and 203) A river-side town; (204) View on the Yangtse river; (205) The bow of a boat from the stern; (206) Typical view on the Yangtse river; (207) Upper end of Fu-chau; (208) The stern of a boat from the bow; (209) A river-side town; (210–212) "Between horizontal strata of red sandstone;" (213) View above Wan-hsien; (214) A tributary stream of the Yangtse river; (215) The landslip forming the new rapid, upper edge of slip; (216) The landslip forming the new rapid, face of slip; (217) Below the new rapid; (218) Bound upstream; (219) The long straight reaches; (220) Six men to the bow sweep; (221) An overfall of the bank; (222 and 223) Wan-hsien to Kwei-chu-fu; (224) The Wind-box gorge; (225) Kwei-chu-fu; (226) A pinnacle in the Wind-box gorge; (227) Below the Wind-box gorge; (228) Side ravine in the Wind-box gorge; (229) Lower end of the Wind-box gorge; (230) Kwei-chu-fu to Ichang; (231) Bridge on the towing-path; (232) Sailing upstream through the gorges; (233) Junk and tender; (234) Junk sailing upstream; (235) Japanese gunboat on the lower Yangtse river; (236) Pinnacle in the I-chang gorge; (237) Village in the gorges; (238) A fifteen-ton junk.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

15'
118°
45'
30'
Athabasca Pass
Whirlpool R.
4.400
5.120
5.710
30'
Committees
Punch Bowl
Peak
10505
Mt. Brown
9.050
Mt. Hooker
Falls
Athabasca R. Eastern Br.
5.000
Athabasca R. Western Branch
Fortress L.
Wood R.
4.330
To Boat Encampment
10.050
Diadem Pk
11.500
Pk Woolley
11.700
Glacier
Peak 11.450
Mt Alberta
12.500
15'
Centennial Divide
Mt Columbia
12.500
Columbia Glacier
High Peak
12.000
52°
West Branch
To Boat Encampment on the Big Bend of the Columbia River
Stephens Range
Stephens Creek
Level ground covered with pine woods
Mt Fisher
2.600
2.700
45'
High Peak


30'
15'
117°
45'
30'
15'
30'
15'
52°
45'
SKETCH MAP OF THE
CANADIAN
ROCKY MOUNTAINS
BY
J. NORMAN COLLIE F.R.S.
1897 - 1898 - 1900 - 1902.
Sources of Information:- Maps by Drewry and MacArthur, by Walter D. Wilcox, by C.L. Noyes and C.S. Thompson and G.P. Baker and I.B. Stewart and Prof.r A.P. Coleman.
Heights marked with an asterisk (1300*) approximate only.
Scale of Miles.
0 5 10 20
Natural scale 1:500,000 or 7.9 miles = 1 inch.
Routes ____ Heights in feet.
Glacier
Pobokan Cr.
Brazeau Lake
Brazeau River
Jonas Cr.
Pass
Shingle Flat or Sun Wapta
Jonas Pass
Camp
Waterfall
Camp
Rockfall
Shingle Flat
Pt Stutfield
Wild Sheep Hills
Cataract Pass
7580
Pt Wilcox
Pass
Hilgel Pk
Slabs of rock
Camp
Waterfall
Pt Douglas
Mt Athabasca
Camp
Waterfall
Cataract River
Sentinel Mt
Columbia Dome
Columbia Glacier
Columbia Ice Fields
Mt Coleman
Pinto L.
5850
Pass
Mt Saskatchewan
Camp
Waterfall
Mt Cline
Kootenay Plains
White Rabbit Cr.
Mt Bryce
Thompson Pass
6800
Mt Wilson
Wilson Glacier
Camp
Mt Sifleur
Saskatchewan R.
Camp
Valley of Lakes
Survey Pk
Camp
Mt Murchison
Alexandra
Mt Lyell
Mt Sullivan
7858
Mt Sarbach
10.700
Camp
5.400
Sifleur River
Lyell Creek
Lyell Ice Field
Lit Mt Forbes
Kaufmann Peaks
Isabella L.
Coat Peak
8.200
7.500
Bush Peak
11.000
Snow Peak
Mt Forbes
12.000
Pyramid
10.700
Camp
Waterfall L.
5.100
Shingle Flats
Camp
3.000
Bush River
Howse Pk
10.800
Mt Silverhorn
Mt Noyes
12.000
Rock Tower
Camp
3.750
Snow Peak
Howse Pass
4800
Mt Weed
Mt Observation
Mt Conway
Mt Dent
Mt Freshfield
10.900
Mt Pilkington
Mt Walker
Bear Creek
Tresspassers Cabin
Bow Pass
6.800
Mt Thompson
10.300
Pass
9.100
Upper Bow L.
5.700
Dolomite Peak
Pipestone Pass
8.300
Mt Molar
Black Rock Pk.
Fish Lake
3.100
Mummery
11.000
Spencer Range
9.000-10.000
8.900


Stephens Range
Stephens Glacier
Stephens Creek
To Boat Encampment on the Big Bend of the Columbia River
Level ground covered with pine woods
Steppe rise Rapids
Mt Pisgah
2700
2600
9700
2800
45'
High Peak
Spencer Range
Low wooded Range
SELKIRK
30'
High Peak
Mountain Creek
Hermit Range 9.530
Mt Tupper
Carnes Creek
7357
Cheops
9870
15'
Columbia River
Ross Pk
7618
Mt Bonney
10.625
Albert Canyon
2.849
6.352
Illecillewaet River
North Branch Illecillewaet
Ironmapplenux River
Twin Butte
Revelstake
1475
51°
118°
45'


Mt Sullivan 7858
Mt Sorbsh 10.700
Lit Mt Forbes
Kaufmann Peaks
Mt Forbes 12.000
Pyramid 10.700
Camp Waterfowl L. 6.100
Howse Pk 10.850
Mt Noyes 10.000
Mt Silverhorn
Rock Tower
Camp 8.750
Isabella L.
Sifleur River
Goat Peak 8.200
Bush Peak 11.000
Snow Peak
Camp 3.000
Shingle Flats
Bush River
Howse Pass 4800
Mt Conway
Mt Dent
Mt Freshfield 10.900
Mt Pilkington
Mt Walker
Mt Weed
Mt Observation
Camp 5.800
Trappers Cabin
Bow Pass 6.800
Mt Thompson 10.700
Upper Bow L. 6.700
Pass 8.100
Dolomite Peak
Pipestone Pass 8.300
Mt Molar
Fish Lake 3.100
Black Rock Pk.
Mummery 11.000
Gap
Mt Collie 10.700
Baker Pass 6.700
Mt Gordon 10.600
Mt Balfour 10.873
Hidden Mt
Lower Bow L. 6.430
Pass to Pipestone
Mt Hector
Blaeberry Creek
Ice Fields
Emerald Range
Mt Daly 10.250
Bow Valley
Camp
DONALD 2.530
Beaver Mouth 2.500
Six Mile Creek 2.900
Dog Tooth Mountains
Van Horne Range
Moberley 2.540
Moberley Peak
Emerald Lake
Mt Field
Field 4.050
Mt Stephen 10.495
Hector 5.490
Cathedral Mt
Lefroy 10.008
L. Louise
Mt Aberdeen
Mt Victoria 11.500
O'Hara L.
Mt Lefroy 11.400
Mt Carnarvon
Otter Tail 3.700
Hungabee 11.600
Eldon
Mt Temple 11.658
Pass 8.100
Neptuak 10.500
Bear Creek 3.500
Grizzly Creek
Mt Macdonald 9.440
Golden 2.550
Mt Hunter
Chancellor Pk
Eagle Pk 9.200
Mt Sir Donald 10.645
Palliser 3.250
Leanchoil 3.570
Mt Vaux
Mt Goodsir
Canyon Creek
Fifteen Mile Creek
Mt Macoun
Mt Dawson 10.800
Beaver River
Beaverfoot Range 8000-9000
Beaverfoot River
Ice River 4.148
Spillimacheen R. North Fork
Duncan Pass
Kicking Horse Pass
Otter Tail R.
Vermilion R.
Deltaform Mt
Paradise Valley
Beaver Cr.
Blackwater Creek
Blackwater Cr.
Westabie Cr.
Blaeberry Peak
Falls
Camp
Pass
Range
Creek
Fork
River
Lake
Peak
Mt
Pk.
Cr.
Glacier
Ice Field
Trappers Cabin